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Taxonomic Studies on *Hyale* (Crustacea, Amphipoda, Hyalidae) from the Coast of Japan and Adjacent Waters

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Abstract Material from the genus *Hyale*, family Hyalidae, collected from the coast of Japan and adjacent waters was examined for the present work. This study revealed seven species, among which five were new to science, two were new to Japan. Herewith new species: *H. kajiharai* sp. nov., *H. nuda* sp. nov., *H. triangulata* sp. nov., *H. misakiensis* sp. nov., and *H. latimana* sp. nov. were described, and *H. affinis* Chevreux and *H. honoluluensis* Schellenberg were re-diagnosed. *Hyale bassargini* Derzhavin was redescribed based on the type material. In total the number of *Hyale* species of Japanese waters is 15. A key to the species of *Hyale* from Japanese waters is presented.

Key words: Amphipoda, Hyalidae, *Hyale*, taxonomy, Japanese waters

Introduction

The main generic characteristics of the genus *Hyale* Rathke, 1837, family Hyalidae, are the maxilla 1, which bears 1-articulate palp and the uropod 3, which lacks an inner ramus (Barnard and Karaman, 1991). Hyalids are commonly found among algae and mussels in the intertidal zone and shallow waters. They are found from cosmopolitan, mostly warmer waters. Eighty species currently assigned to the *Hyale* (Barnard and Karaman, 1991; Kim and Kim, 1991; Serejo, 1999, 2001).

In Japanese *Hyale*, though Iwasa (1939) described four species of *Hyale*, *H. novaezealandiae*, *H. Dollfusi*, *H. shmidtii* and *H. gracilis*, from Japanese coast for the first time. He misidentified the former three species, thereafter, they were erected as new species (Hiwatari and Kajihara, 1981a, b; this study) and the latter *H. gracilis* was given a new name as *Parhyale iwasai* by Shoemaker (1956). Hirayama (1980) described six species of *Hyale*, *H. corallinacola*, *H. didendactyla*, *H. ishigakiensis*, *H. spp. 1, 2, and 3* from the Ryukyu Archipelago at the southern end of Japan. However, a decision of species for the latter *H. spp. 1, 2, and 3* were deferred in this study because of necessary further comparison with other species. Hiwatari and Kajihara (1981a, b) described four species of *Hyale*, *H. barbicornis*, *H. punctata*, *H. uragensis* and *H. pumila*, from Japanese coast. In total the number of *Hyale* species from Japanese coast was seven.

The author's hyalid specimens, collected on sampling trips and donated by colleagues, have been accumulating since the publication of two papers on the genus in 1981.

The present paper deals with eight *Hyale* species, among which five – *H. kajiharai*, *H. nuda*, *H. triangulata*, *H. misakiensis*, and *H. latimana* – are new to science; and new to Japan of *H. affinis* Chevreux, 1908, and *H. honoluluensis* Schellenberg, 1938, are re-diagnosed. *H. bassargini* Derzhavin, 1937 is redescribed on the basis of the type material. As an extension of this study, some of *Hyale* species will be described in the future. The type material of the five new species is deposited in the National Science Museum, Tokyo (NSMT).

Family Hyalidae Bulycheva, 1957 Genus *Hyale* Rathke, 1837

Key to the Species of *Hyale* from Japanese waters

1. Gnathopod 1, carpus lobe with deeply serration; coxae 1-4 with strong cusps on posterior margins 2
 Gnathopod 1, carpus lobe lacking serration; coxae 1-4 lacking posteriorly cusps or with weakly cusps 5
2. Antenna 2, peduncular article 5 with clusters of fine setae on posterior margin; uropod 1, peduncle with elongate distomedial spine *H. barbicornis* Hiwatari and Kajihara, 1981a
 Antenna 2, peduncular article 5 lacking clusters of fine setae; uropod 1, peduncle with medium distomedial spine 3
3. Gnathopod 2, palm of propodus subequal to posterior margin in length; peduncle of uropod 1 with normal space of dorsolateral spines *H. uragensis* Hiwatari and Kajihara, 1981a
 Gnathopod 2, palm of propodus longer than posterior margin; peduncle of uropod 1 with irregular space of dorsolateral spines 4
4. Eyes, medium, subcircular; maxilliped, palp article 4 shorter than article 3 *H. bassargini* Derzhavin, 1937
 Eyes, very large, elliptical; maxilliped, palp article 4 subequal to article 3 *H. punctata* Hiwatari and Kajihara, 1981a
5. Pereopods 3-7, each propodus with locking spine; outer rami of uropods 1 and 2 lacking dorsal spines *H. nuda* sp. nov.
 Pereopods 3-7, each propodus with 2 locking spines; outer rami of uropods 1 and 2 with a few dorsal spines 6
6. Uropod 1, peduncle with medium distolateral spine *H. ishigakiensis* Hirayama, 1980
 Uropod 1, peduncle with elongate distolateral spine 7
7. Uropod 3, ramus as long as 1/2 of peduncle 8
 Uropod 3, ramus longer than 1/2 of peduncle 9
8. Pereopods 5-7, distalmost locking spine on propodi subequal to proximal locking spine in length *H. triangulata* sp. nov.
 Pereopods 5-7, distalmost locking spine on propodi smaller than proximal locking spine *H. misakiensis* sp. nov.
9. Uropod 1, peduncle subequal to rami in length 10
 Uropod 1, peduncle shorter than rami 12
10. Antenna 2, relatively short, about 40% of body length, flagellum less than 20-articulated *H. kajiharai* sp. nov.
 Antenna 2, long, about 50% of body length, flagellum more than 25-articulated 11
11. Gnathopod 1, propodus palmar corner defined by one spine (outer) *H. latimana* sp. nov.
 Gnathopod 1, propodus palmar corner defined by two spines (inner and outer) *H. affinis* Chevreux, 1908
12. Gnathopod 1, dactylus of propodus bifurcate *H. didendactyla* Hirayama, 1980
 Gnathopod 1, dactylus of propodus ordinary, simple 13
13. Gnathopod 2, palm of propodus bearing truncate process near dactylus hinge *H. pumila* Hiwatari and Kajihara, 1981b
 Gnathopod 2, palm of propodus lacking truncate process 14
14. Gnathopod 2, palm of propodus much longer than posterior margin *H. honoluluensis* Schellenberg, 1938
 Gnathopod 2, palm of propodus subequal to posterior margin in length *H. corallinacola* Hirayama, 1980

***Hyale bassargini* Derzhavin, 1937**

(Japanese name: Basarugin mokuzu yokoebi, new)
(Figs. 1-3)

Hyale bassargini Derzhavin, 1937, p.93, pl.4, fig. 2; Gurjanova, 1951, pp.818-819, fig. 572

Hyale novaezealandiae : Bulycheva, 1957, pp.100-101, figs. 36a,b

Material examined

1 male, 23.9 mm, deposited in the Zoological Institute of St. Petersburg, Russia, No.115/33477, littoral zone, Japan Sea, Petrof Island, collected by E. F. Gurjanova, 25 September 1934.

Diagnosis

Body large, stout. Antennae 1 and 2: antenna 1 reaching distal end of peduncular article 5 of antenna 2; antenna 2 short, about 30% of body length. Eyes: medium, subcircular. Maxilla 1: palp 1-articulate with constriction slightly beyond midlength. Maxilliped: palp articles 1-3 broad; article 4 shorter than article 3. Gnathopod 1: carpus lobe with deeply serration and pectinate long setae. Gnathopod 2: propodus tapering, palm oblique and sinuate, longer than posterior margin, defined by pair of spines. Pereopods 3-7: each propodus with pair of locking spines; each dactylus bearing giant seta and castellation near midlength on inner margin. Coxae 1-4: relatively deep, with strong cusps on middle of posterior margin. Pleopods 1-3: each peduncle with 2, 3, and 3 coupling spines, respectively; inner margin of basal articles on inner rami lined with 7, 7, and 6 clothes-pin spines, respectively. Uropod 1: peduncle longer than rami, with marginal spines irregular space between distalmost spine and next proximal spine.

Description

Male: Body large, stout (Fig. 1a).

Head (Fig. 1a), anterior margin of lateral cephalic lobe truncate vertically. Eyes medium, subcircular.

Antenna 1: antenna 1 reaching distal end of peduncular article 5 of antenna 2; peduncular article 3 reaching half of peduncular article 4 of antenna 2; each article of flagellum with 2 short aesthetascs (Fig. 1b); flagellum 15-articulated. Antenna 2: short, about 30% of body length; peduncular article 5 slightly longer than article 4, distal margin of peduncular articles 4 and 5 with setae (Fig. 2b); each article of flagellum with short setae near distally (Fig. 1c); flagellum 13-articulated, 1.2 times as long as peduncle.

Upper lip (Fig. 1d): anterior margin rounded with short bristles. Left mandible (Fig. 2e): lacinia 5 1/2 dentate with 4 accessory blades, distal end of molar with long, plumose seta. Right mandible (Fig. 2f): lacinia tricuspat with 4 accessory blades. Lower lip (Fig. 1e): ordinary, inner lobes indistinct. Maxilla 1 (Fig. 2c): palp 1-articulate with constriction slightly beyond midlength. Maxilla 2 (Fig. 2d): inner plate with large pectinate seta at middle of medial margin; apical setae of outer plate longer than that of inner. Maxilliped (Fig. 2g): palp articles 1-3 broad; article 4 shorter than article 3, with short apical spine and marginal setae.

Gnathopod 1 (Fig. 2h): basis anterodistal margin slightly produced, lined with 4 setae in middle of posterior margin; carpus lobe with deeply serration and pectinate long setae (Fig. 2i); propodus expanded distally, palm oblique, simple, defined by pair of spines, posterodistal margin with a group of setae; dactylus fitting palm. Gnathopod 2: basis anterior margin concave, and anterodistal corner slightly expanded and lined with small setae, posterior margin lined with setae; ischium anterior margin with a process; propodus tapering, palm oblique and sinuate, longer than posterior margin, defined by pair of spines, armed with spines and setae (Fig. 2j); dactylus fitting palm. Pereopods: pereopods 3-7 each propodus with pair of locking spines (Fig. 3a-d) subequal in size; each dactylus bearing giant striated seta proximally, with castellation near middle, face lacking striation.

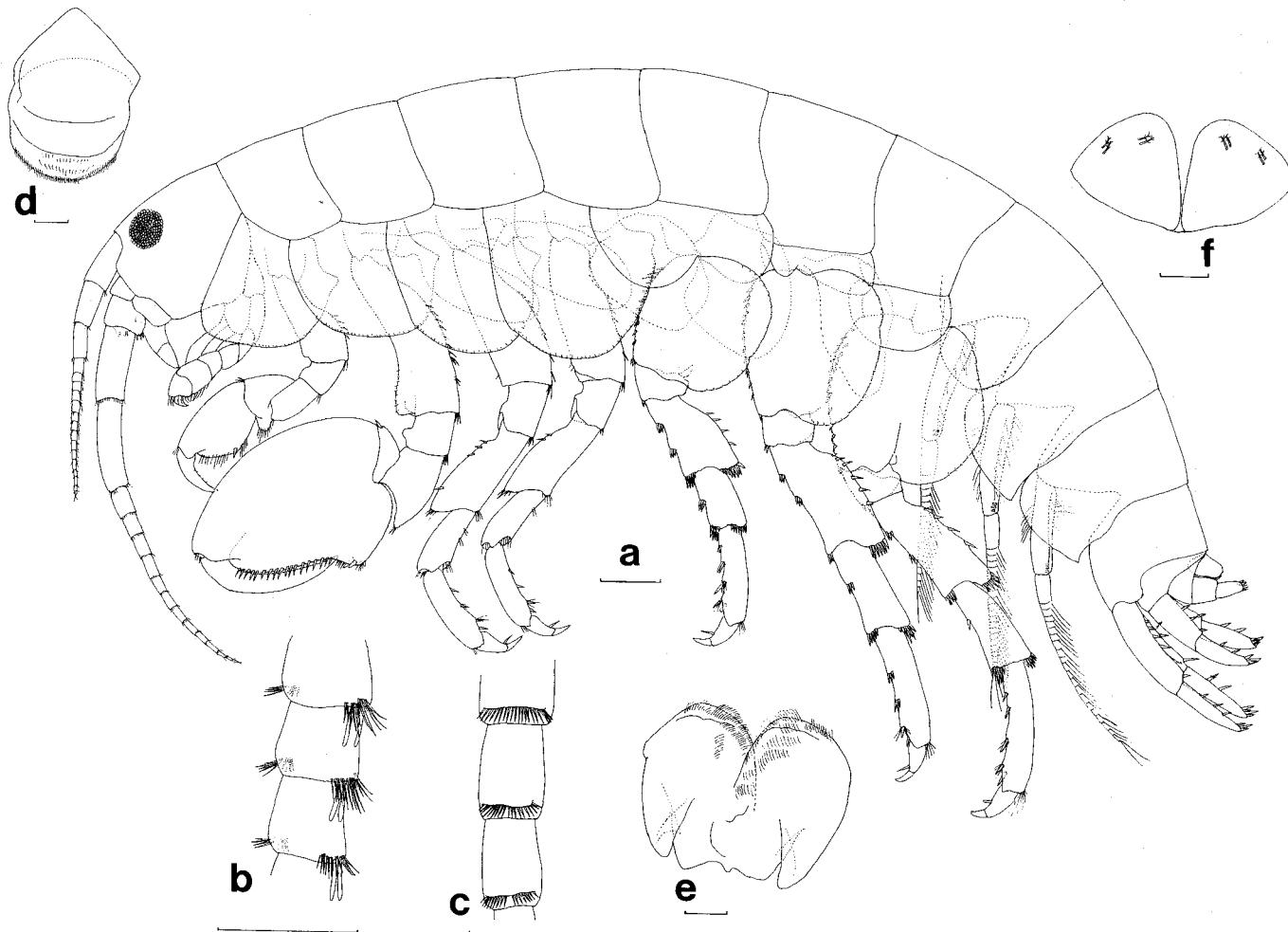


Fig. 1 *Hyale bassargini* Derzhavin. Male, 23.9 mm. a, lateral view; b, part of flagellum of antenna 1; c, part of flagellum of antenna 2; d, upper lip; e, lower lip; f, telson. Scale bars: a = 1 mm; b-f = 0.2 mm.

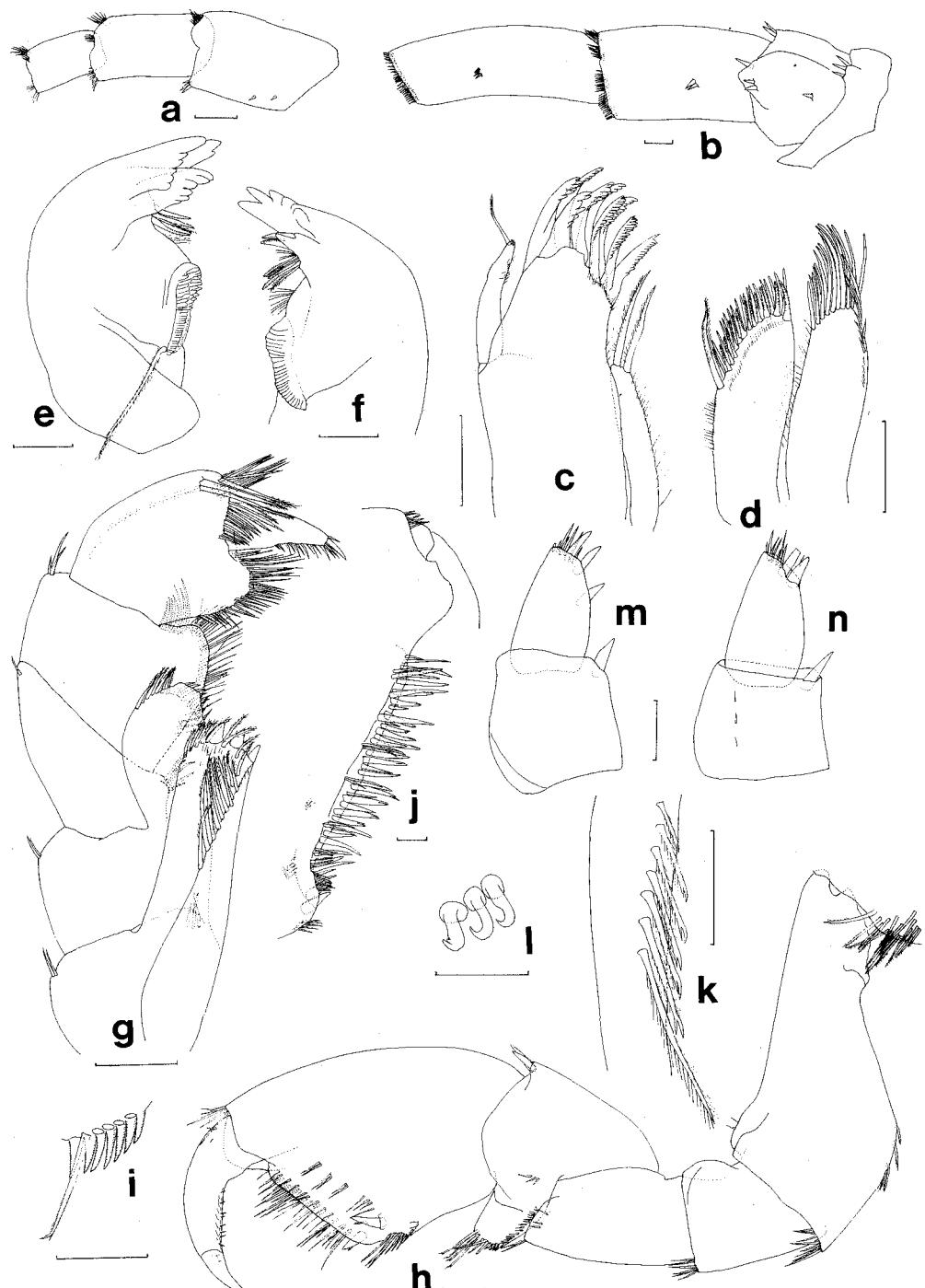


Fig. 2 *Hyale bassargini* Derzhavin. Male, 23.9 mm. a, peduncular articles of antenna 1; b, peduncular articles of antenna 2; c, maxilla 1; d, maxilla 2; e, left mandible; f, right mandible; g, maxilliped; h, gnathopod 1; i, part of deeply serration and pectinate long seta of carpal lobe of gnathopod 1; j, palm of gnathopod 2; k, six clothes-pin spines on inner ramus of pleopod 3; l, three coupling spines of pleopod 3; m, left uropod 3; n, right uropod 3. Scale bars: a-n = 0.2 mm.

Coxae: coxae 1-4 (Fig. 1a) relatively deep, with strong cusps on middle of posterior margin: lower margins of coxae 2-4 rounded: coxa 4 with simple excavation posteroproximally: coxa 6 with anterior lobe small, shallower than posterior lobe: coxal gills subovate.

Pleopods 1-3: each peduncle bearing 2, 3 and 3 coupling spines, respectively (Fig. 2l): inner margin of basal articles on inner rami lined with 7, 7, and 6 clothes-pin spines, respectively (Fig. 2k).

Epimeron 1 (Fig. 1a): lower margin rounded. Epimera 2 and 3: posterodistal corner subacute.

Uropod 1 (Fig. 1a): peduncle longer than rami, with marginal spines placed irregular space between distalmost spine and next proximal spine. Uropod 3 (Fig. 2m, n): peduncle broad: ramus with a spine on middle of margin and 2 apical spine (left), or with 2 apical spines (right).

Telson (Fig. 1f) cleft completely, lateral margin of each lobe with 2 paired small plumose setae.

Remarks

Although Bulycheva (1957) described that *Hyale bassargini* was synonymous with *H. novaezealandiae* (Thomson, 1879), *H. bassargini* can be obviously distinguished from the latter illustrated by Hurley (1957, as *Hyale grandicornis* forma *novaezealandiae*) in the following features: in the uropod 1, the marginal spines on the peduncle are placed irregular space between distalmost spine and next proximal spine (vs. normal space); in the uropod 3, ramus is short and broad, and as long as peduncle (vs. ramus is slender, and longer than peduncle).

Hyale bassargini is very similar to *H. pugettensis* (Dana, 1853) identified by Bousfield. Comparison with the specimen of *H. pugettensis* deposited in the National Museum of Canada, collected from British Columbia, revealed that *H. bassargini* differs from the latter by the following features: in the pereopods 3-7, pair of locking spines are similar size (vs. distalmost spine of locking spines is slightly larger than proximal spine); in the uropod 3, ramus is short and broad, and as long as peduncle (vs. ramus is slender, and slightly longer than peduncle); in the telson, lateral margin of each

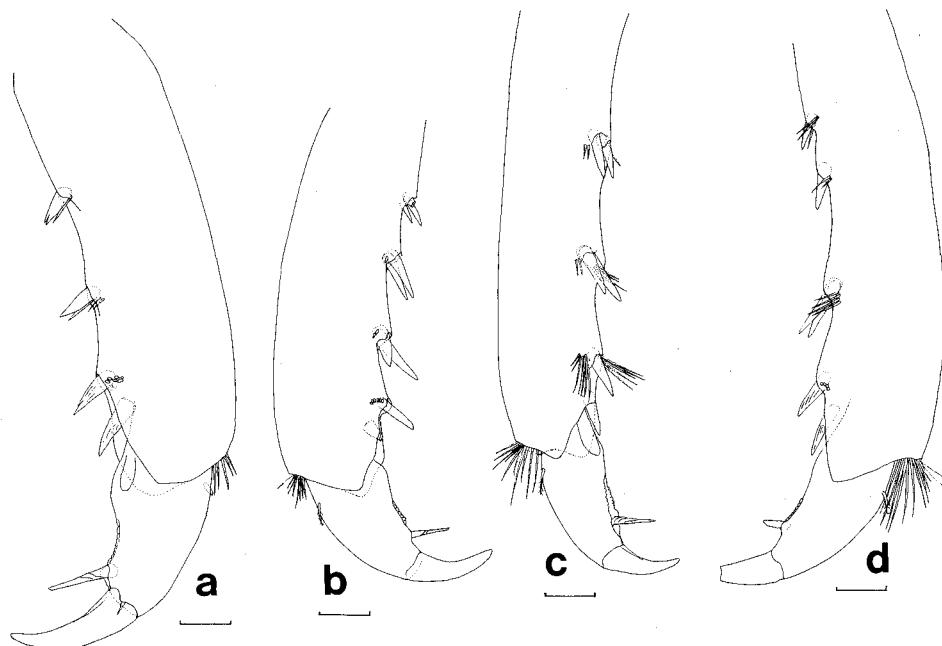


Fig. 3 *Hyale bassargini* Derzhavin. Male, 23.9 mm. a-d, propodi and dactyli of pereopods 4-7, respectively. Scale bars: a-d = 0.2 mm.

lobe has 2 paired small plumose setae (vs. tip of each lobe has a long seta).

According to Barnard (1979), the *grandicornis* group of *Hyale* comprises species with a large seta on the dactyl of pereopods 3-7 close to the middle of the margin, with dorsal spines on the peduncle of uropod 1 either small or medium sized, and with large eyes. Although *Hyale bassargini* has medium sized eyes, the other characteristics fit *H. grandicornis*. Therefore, it is suggested that *H. bassargini* belongs to *H. grandicornis* complex.

Habitat

This species occurred from littoral zone, down to 2 m in depth (Gurjanova, 1951). The species has probably the ability to saltate in air on the basis of the following morphological characteristics: rami of the uropod 1 are shorter than the peduncle; peduncle of the uropod 3 is short and broad. "*Hyale grandicornis*" group inhabits intertidal and semi-terrestrial rockpool and increased saltation ability with increasing height of intertidal station (Bousfield, 1981). Among Japanese *Hyale* species, *H. barbicornis*, *H. punctata* and *H. uragensis* have the ability to saltate in air.

Distribution

This species is known from the coast of the Sea of Japan and west coast of the south Sakhalin in Russia (Bulcheva, 1957).

Hyale kajiharai sp. nov.

(Japanese name: Kajihara mokuzu, new)

(Figs. 4-6)

Material examined

1 male and 1 ovigerous female from the intertidal zone at Sokodo, Hachijo Island (33°10' N, 139°50' E), 19 April 1984, collected by Dr. S. Suda.

Holotype: male (NSMT-Cr.15149, slide mount), 5.8 mm, from Hachijo Island, 19 April 1984.

Allotype: ovigerous female (NSMT-Cr.15150, slide mount), 3.9 mm, same data as holotype.

Diagnosis

Antenna 2: relatively short, about 40% of body length, flagellum 16 articles. Eyes: medium to large, elliptic form. Maxilla 1: palp 1-articulate, elongate. Gnathopod 1: propodus expanded distally, palmar margin slightly convex, near middle of palm with 1 striated peg spine (inner) and 3 long spines (outer), palmar corner slightly hollowed. Gnathopod 2: palm of propodus strongly oblique, much longer than posterior margin, bearing truncate process near dactylus hinge; dactylus elongate. Pereopods 3-7: slender, each propodus with pair of locking spines, proximal locking spine largest among marginal spines. Uropod 1: peduncle with elongate distolateral spine.

Description

Male (holotype): Eyes (Fig. 4a): medium to large, elliptic form.

Antenna 1: peduncular article 3 reaching near middle of peduncular article 4 of antenna 2; posterodistal margin of peduncular articles 1 and 2 with 2 and 1 of spines, respectively (Fig. 5a); each article of flagellum with 2 long aesthetascs (Fig. 4b); flagellum with 8+ articles. Antenna 2: relatively short, about 40% of body length; peduncular article 5 subequal to articles 3 and 4 combined in length; distal margin of peduncular articles 3, 4 and 5 with several small spines (Fig. 5b); each article of flagellum with 2 groups of short setae distally (Fig. 4c); flagellum 16-articulated, 1.7 times as long as peduncle.

Upper lip (Fig. 4d): anterior margin rounded with short bristles. Left mandible (Fig. 5e): lacinia 5-dentate with 3 accessory blades, distal end of molar with long, plumose seta. Right mandible (Fig. 5f): lacinia tricuspat with 2 accessory blades. Lower lip (Fig. 4e): ordinary, inner lobes indistinct. Maxilla 1 (Fig. 5c): palp 1-articulate, elongate and longer than apical spine teeth on outer plate.

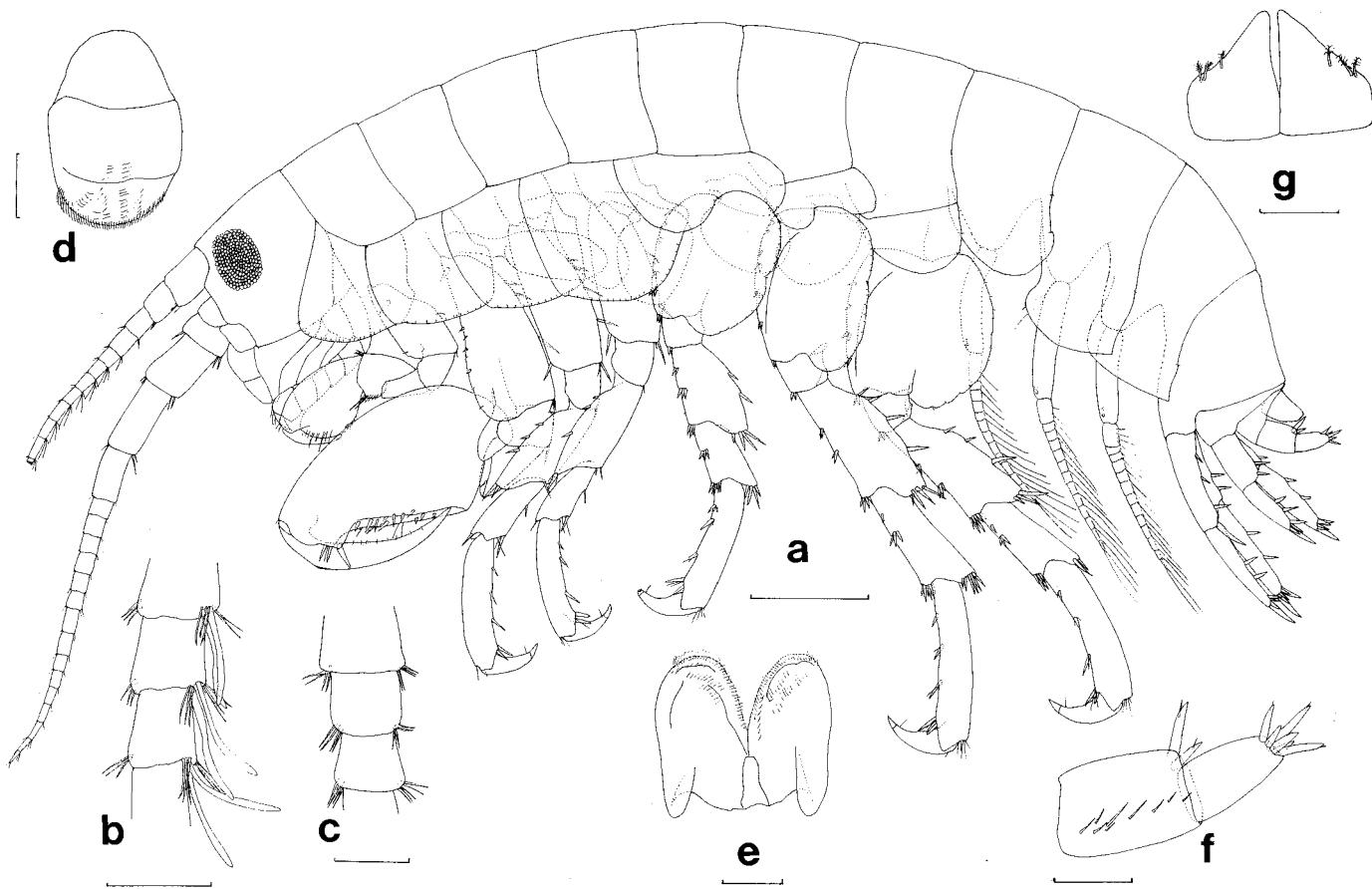


Fig. 4 *Hyale kajiharai* sp. nov., holotype (male, 5.8 mm). a, lateral view; b, part of flagellum of antenna 1; c, part of flagellum of antenna 2; d, upper lip; e, lower lip; f, uropod 3; g, telson. Scale bars: a = 0.5 mm; b-g = 0.1 mm.

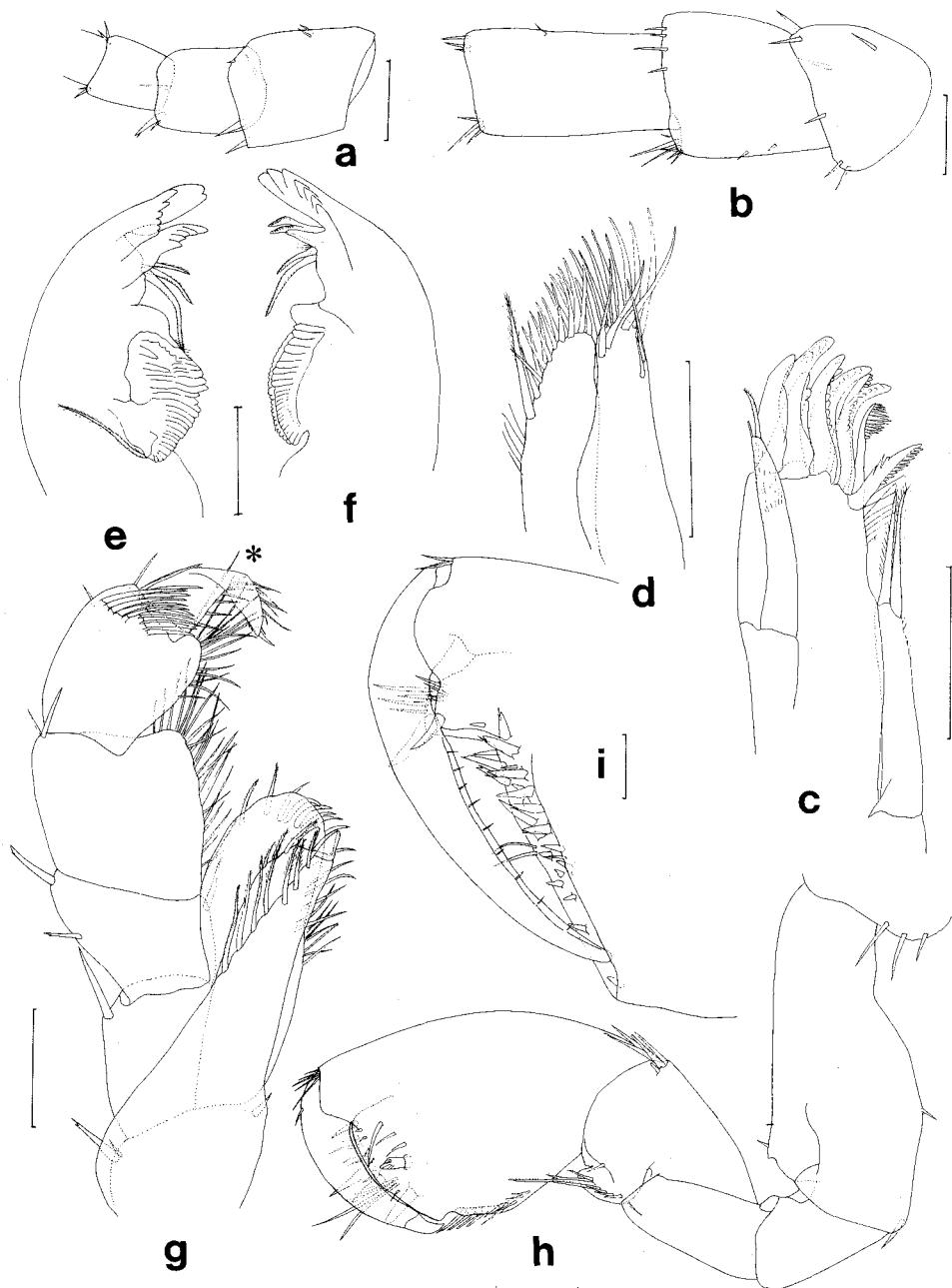


Fig. 5 *Hyale kajiharai* sp. nov., holotype (male, 5.8 mm). a, peduncular articles of antenna 1; b, peduncular articles of antenna 2; c, maxilla 1; d, maxilla 2; e, left mandible; f, right mandible; g, maxilliped; h, gnathopod 1; i, palm and dactylus of gnathopod 2. *: Faulty slide mount. Scale bars: a-i = 0.1 mm.

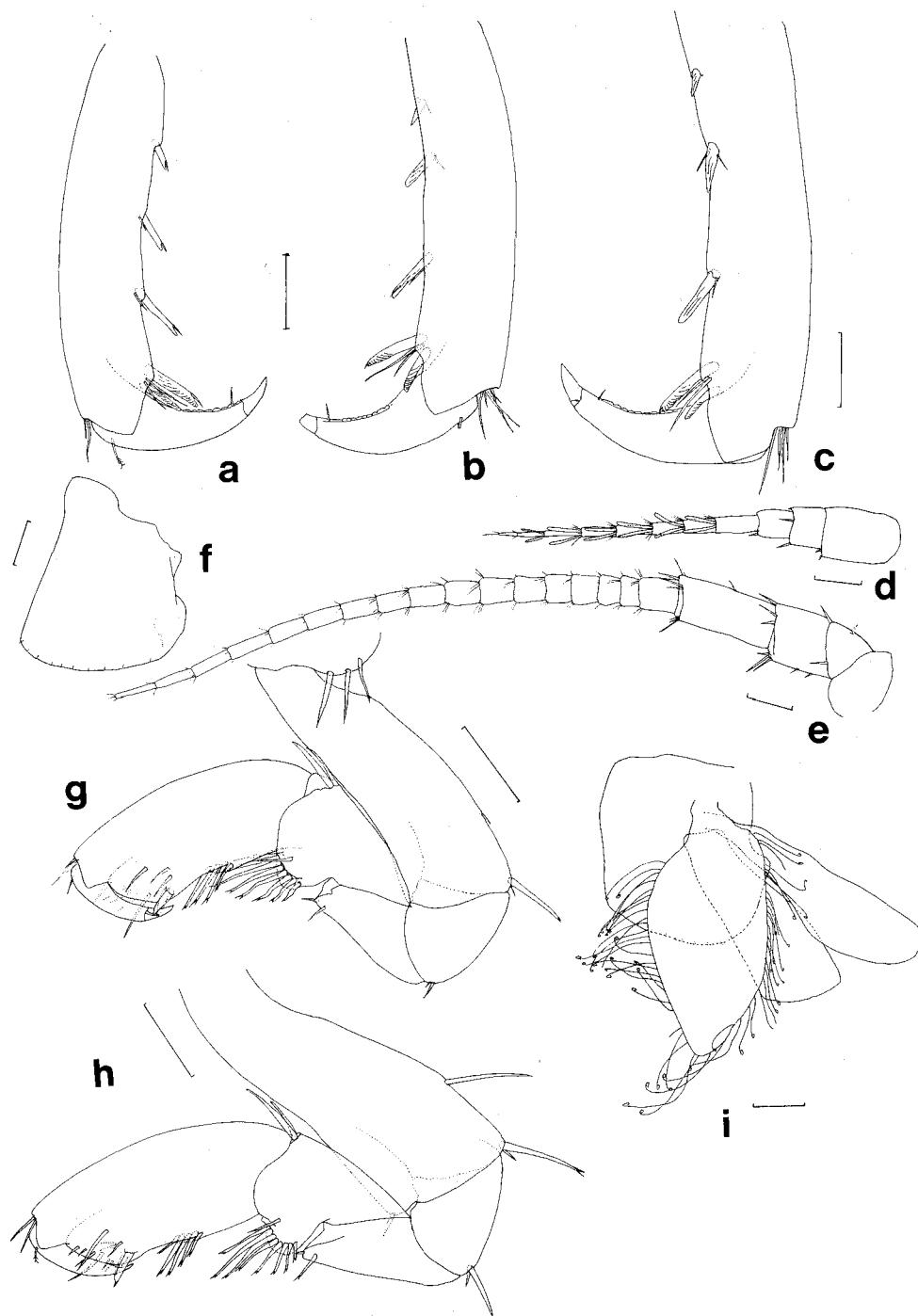


Fig. 6 *Hyale kajiharai* sp. nov. a-c, holotype (male, 5.8 mm). a-c, propodi and dactyli of pereopods 3, 5, and 7, respectively. d-i, allotype (female, 3.9 mm). d, antenna 1; e, antenna 2; f, coxa 1; g, gnathopod 1; h, gnathopod 2; i, coxa 2, brood plate and gill of gnathopod 2. Scale bars: a-i = 0.1 mm.

Maxilla 2 (Fig. 5d): inner plate with large pectinate seta at middle of medial margin; apical setae of outer plate longer than that of inner. Maxilliped (Fig. 5g): palp article 4 with a short apical spine and marginal setae (article 4 of palp folded in figure due to wrong condition in slide mount).

Gnathopod 1 (Fig. 5h): basis trapezoidal in form; carpus lobe shallow, bearing 8 setae, lacking serration; propodus expanded distally, palmar margin slightly convex, near middle of palm with a striated peg spine (inner) and 3 long spines (outer), palmar corner slightly hollowed, posterodistal margin bearing 9 setae; dactylus curved. Gnathopod 2: basis broadly lobate anterodistally and lined with small setae; ischium with hemicircular lobe; merus protrusively rounded apically; palm of propodus strongly oblique, much longer than posterior margin, bearing truncate process near dactylus hinge, spines throughout (Fig. 5i); dactylus elongate, fitting palm. Pereopods: pereopods 3-7 slender, each propodus with 3 marginal spines and pair of locking spines, proximal locking spine largest among marginal spines, locking spines with heavily striated in corkscrew pattern distally; dactyli bearing distal setules and castellations (Fig. 6a-c).

Coxae: coxa 1 (Fig. 4a) slightly extended forward; coxae 2 and 3 subquadrate; coxa 4 widest with bisinuate posteroproximal excavation; coxal gills relatively small.

Pleopods 1-3: each peduncle bearing 2 coupling spines; inner margin of basal article on inner ramus of pleopod 1 lined with 3 clothes-pin spines.

Epimeron 1 (Fig. 4a): lower margin rounded. Epimera 2 and 3: posterodistal corner subacute.

Uropod 1 (Fig. 4a): peduncle subequal to rami, with elongate distolateral spine about 35 % of outer ramus in length; inner and outer rami with 2 dorsal spines, respectively. Uropod 2: inner ramus longer than outer ramus. Uropod 3 (Fig. 4f): peduncle slightly longer than ramus.

Telson (Fig. 4g) cleft completely, lateral margin of each lobe with 3 small plumose setae.

Female (allotype): Antenna 1 (Fig. 6d): each article of flagellum with 2 long aethetascs; flagellum 8-articulated. Antenna 2 (Fig. 6e): peduncular article 5 longer than article 3 and 4 combined; flagellum 17-articulated, 2.5 times as long as peduncle.

Gnathopod 1 (Fig. 6g): basis slender; propodus slender, subrectangular, palm oblique, simple, defined by pair of spines, near middle of posterior margin concave; dactylus fitting palm. Gnathopod 2: similar to gnathopod 1 but larger (Fig. 6h).

Coxa 1 (Fig. 6f): extended forward.

Gill of gnathopod 2 slightly longer than basis of gnathopod 2 (Fig. 6i).

Brood plate of gnathopod 2 (Fig. 6i) subovate, margin with 52 long hooked setae.

Egg number 7.

Remarks

Hyale kajiharai resembles *H. laie* Barnard, 1970, but the new species differs from the latter in the following points: in the propodus of the gnathopod 1, the anterior margin is smooth, and the anterodistal corner is not tumid, and the palmar corner is slightly hollow (vs. the middle of the anterior margin has 2 setae, and the anterodistal corner is tumid, and the palmar corner has a blunt cusp with 2 setae); in the propodus of the gnathopod 2, the palm is longer than the posterior margin (vs. the palm is as long as the posterior margin).

Habitat

The new species inhabits among seaweeds in the intertidal zone.

Distribution

The new species has been found only at Hachijo Island in the Izu Islands of southeastern Japan.

Etymology

The species is named in honour of Dr. T. Kajihara who has encouraged me to progress the

research of the taxonomy and ecology of the Japanese hyalid amphipods.

Hyale nuda sp. nov.

(Japanese name: Togenashi mokuzu, new)

(Figs. 7-9)

Material examined

1 male and 1 ovigerous female from the intertidal zone at Sokodo in Hachijo Island ($33^{\circ}10'N$, $139^{\circ}50'E$), 19 April 1984, collected by Dr. S. Suda.

Holotype: male (NSMT-Cr.15151, slide mount), 10.2 mm, from Hachijo Island, 19 April 1984.

Allotype: ovigerous female (NSMT-Cr.15152, slide mount), 6.6 mm, same data as holotype.

Diagnosis

Antenna 2: relatively short, about 37% of body length; peduncular articles 4, 5 and proximal 10 articles of flagellum bearing dorsally setose. Eyes: medium to small, circular. Left mandible: lacinea 7-dentate with 6 accessory blades. Right mandible: 4 accessory blades. Maxilla 1: palp 1-articulate with constriction near midlength. Maxilla 2: inner plate with long pectinate seta twice as long as apical setae. Maxilliped: palp article 4 slightly longer than article 3; inner margin of inner plate setose, lacking long plumose setae. Gnathopod 2: palm of propodus shorter than posterior margin, bearing weak protrusion near dactylus hinge. Pereopods: pereopods 3-7, each propodus bearing only 1 striated locking spine; pereopods 3 and 4, each propodus lacking marginal spines excluding locking spine. Uropod 1: peduncle with elongate distolateral spine. Uropods 1 and 2: outer rami lacking dorsal spines.

Description

Male (holotype): Anterior margin of lateral cephalic lobe slightly convex. Eyes (Fig. 7a): medium to small, circular.

Antenna 1: peduncular article 3 reaching distal end of peduncular article 4 of antenna 2; distal margin of peduncular articles 1 and 2 with 2 and 3 of spines, respectively (Fig. 8a); each article of flagellum with 2 aesthetascs (Fig. 7b); flagellum 15-articulated. Antenna 2: relatively short, about 37% of body length; peduncular article 5 subequal to articles 3 and 4 combined in length; peduncular articles 4, 5 and proximal 10 articles of flagellum bearing dorsally setose (Figs. 7a, c, 8b); flagellum 23-articulated, 2.3 times as long as peduncle.

Upper lip (Fig. 7d): anterior margin rounded with short bristles. Left mandible (Fig. 8c): lacinia 7-dentate with 6 accessory blades. Right mandible (Fig. 8d): 4 accessory blades. Lower lip (Fig. 7e): relatively broad, subcircular. Maxilla 1 (Fig. 8e): palp 1-articulate with constriction near midlength, as long as apical spine teeth on outer plate. Maxilla 2 (Fig. 8f): inner plate with large pectinate seta twice as long as apical setae. Maxilliped (Fig. 8g): inner margin of inner plate setose, lacking long plumose setae; palp article 4 slightly longer than article 3 (tip of article 4 distorted in figure due to wrong condition in slide mount).

Gnathopod 1 (Fig. 8h): basis trapezoidal in form; merus with posterodistal process; carpus lobe broad, bearing long setae, lacking serration; propodus rectangular, palm oblique, defined by pair of spines, distal half of posterior margin with setae; dactylus fitting palm. Gnathopod 2: basis broadly lobate anterodistally; ischium with hemicircular lobe; merus weakly extended; propodus anterior margin relatively convex, palm shorter than posterior margin, bearing weak protrusion near dactylus hinge (Fig. 8i); dactylus fitting palm. Pereopods: pereopods 3-7, each propodus bearing only 1 striated locking spine (Fig. 7a); pereopods 3 (Fig. 9a) and 4, each propodus with 2 groups of setae posteromarginally, lacking marginal spines excluding locking spine; pereopods 5 (Fig. 9b)-7, each merus, carpus and propodus short, stout; each propodus with 1 small locking spine, next spine much larger and heavily striated, screw-like form, next proximal spines unstriated; pereopods 5 and 6, each

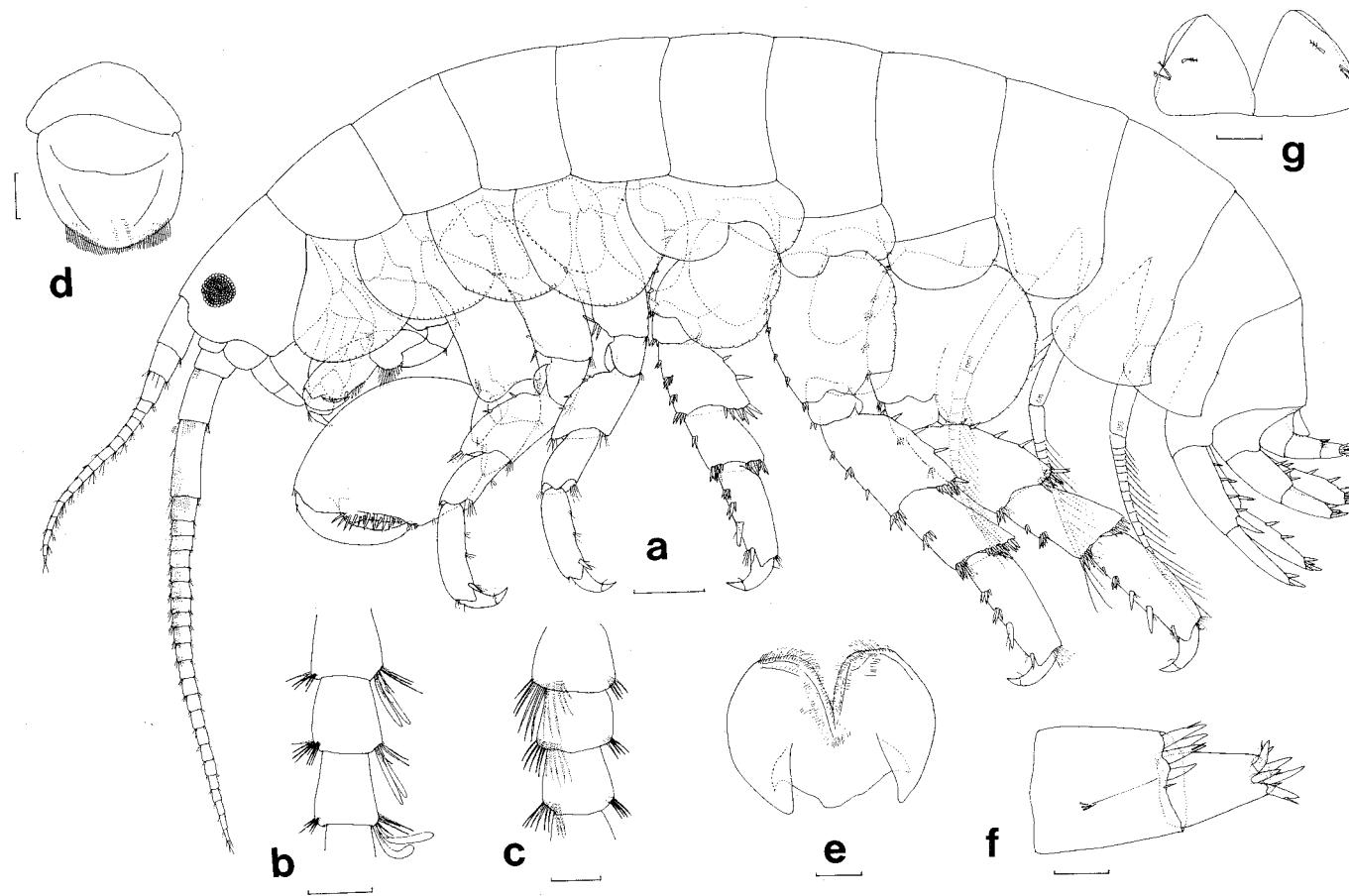


Fig. 7 *Hyale nuda* sp. nov., holotype (male, 10.2 mm).

a, lateral view; b, parts of flagellum of antenna 1; c, part of flagellum of antenna 2; d, upper lip; e, lower lip; f, uropod 3; g, telson. Scale bars: a = 0.5 mm; b-g = 0.1 mm.

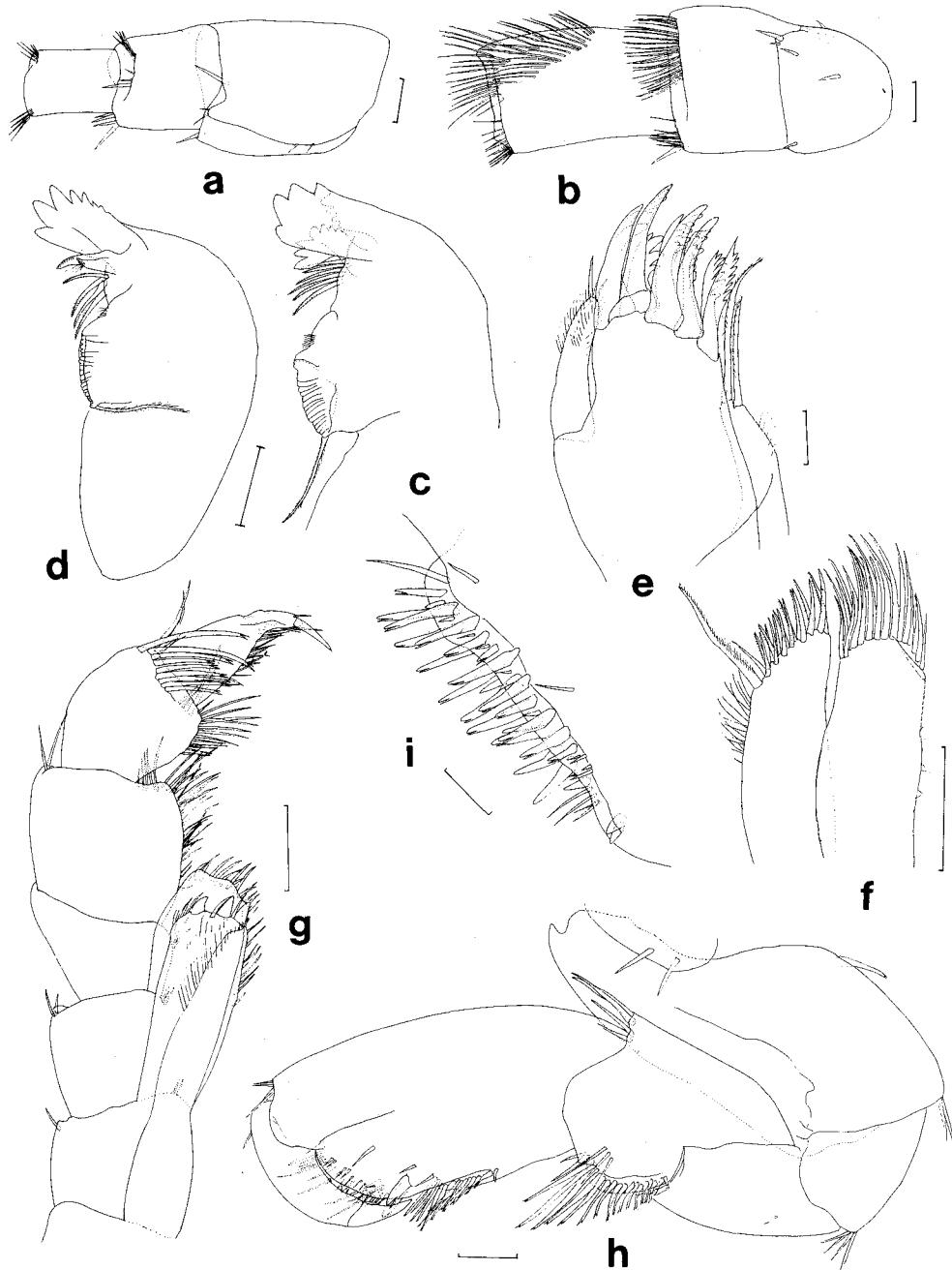


Fig. 8 *Hyale nuda* sp. nov., holotype (male, 10.2 mm). a, peduncular articles of antenna 1 (inner face); b, peduncular articles of antenna 2 (inner face); c, left mandible; d, right mandible; e, maxilla 1; f, maxilla 2; g, maxilliped; h, gnathopod 1; i, palm of gnathopod 2. Scale bars: a-i = 0.1 mm.

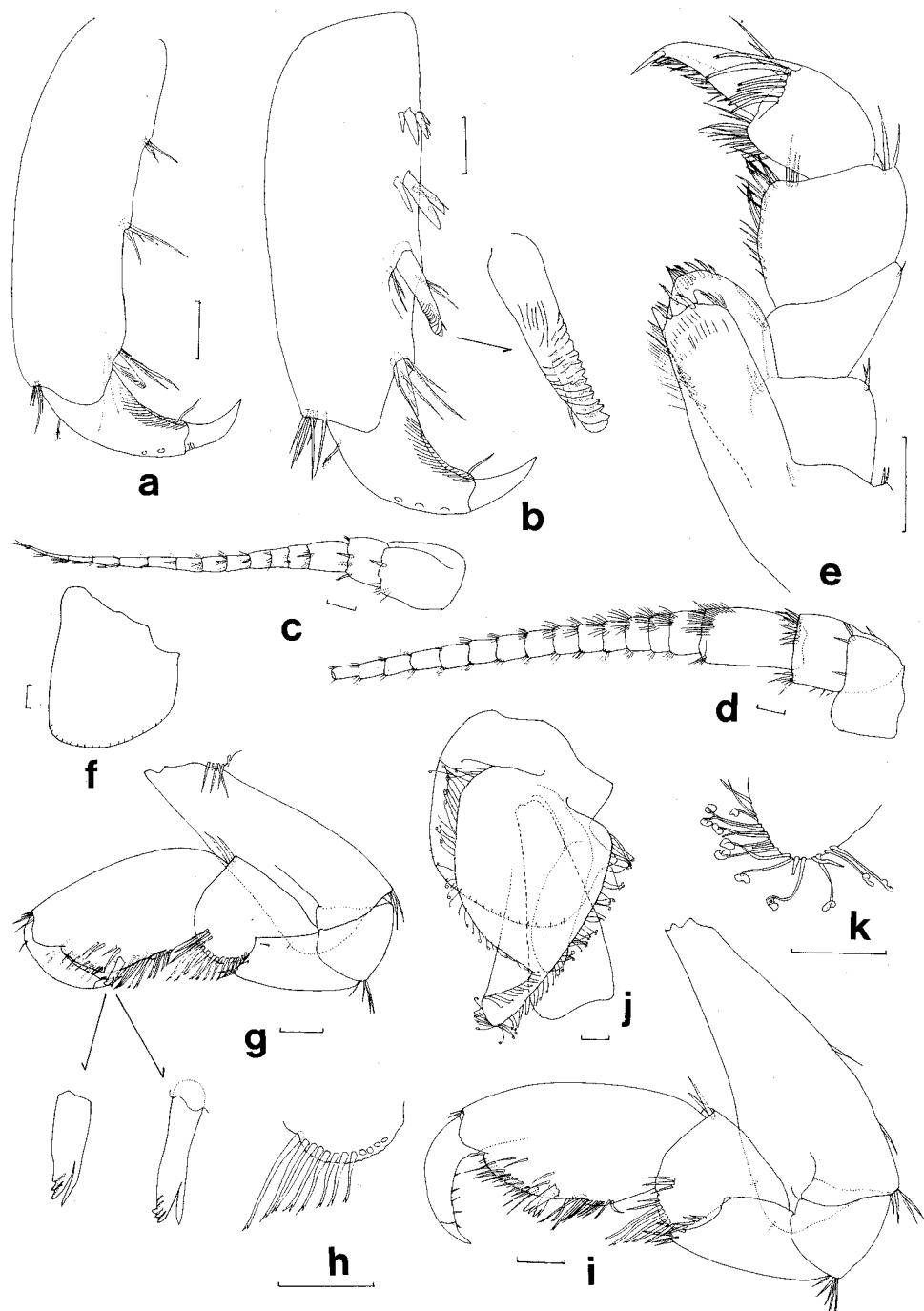


Fig. 9 *Hyale nuda* sp. nov. a, b, holotype (male, 10.2 mm). a, b, propodi and dactyli of pereopods 3 and 5, respectively. c-k, allotype (female, 6.6 mm). c, antenna 1 (inner face); d, antenna 2 (inner face); e, maxilliped; f, coxa 1; g, gnathopod 1; h, long setae of carpal lobe of gnathopod 1; i, gnathopod 2; j, coxa 2, brood plate and gill of gnathopod 2; k, brood setae of brood plate, with detail of setae. Scale bars: a-k = 0.1 mm.

basis with a notch on middle of posterior margin; dactyli of pereopods 3-7 striated, with weak castellations.

Coxae: coxae 1-4 (Fig. 7a) with weak cusps on middle of posterior margin; coxa 1 extended forward; coxae 2-4, lower margins rounded; coxa 4 with simple excavation posteroproximally; coxal gills medium size.

Pleopods 1-3: each peduncle bearing 3, 2 and 2 coupling spines, respectively; inner margin of basal articles on inner rami lined with 5, 6, and 4 clothes-pin spines, respectively.

Epimeron 1 (Fig. 7a): lower margin rounded. Epimera 2 and 3: posterodistal corner subacute.

Uropod 1 (Fig. 7a): peduncle slightly longer than rami, with elongate distolateral spine about 40 % of outer ramus in length; outer ramus lacking dorsal spines. Uropod 2: outer ramus slightly shorter than inner ramus, lacking dorsal spines. Uropod 3 (Fig. 7f): peduncle slightly longer than ramus, peduncle and ramus relatively broad, peduncle with 4 apicodorsal spines; apex of ramus with 6 spines.

Telson (Fig. 7g) cleft completely, lateral margin of each lobe with 3 small plumose setae.

Female (allotype): Antenna 1 (Fig. 9c): flagellum 12-articulated. Antenna 2 (Fig. 9d): setal brushes weaker than that in male; distal margin of article 4 with several spines.

Maxilliped (Fig. 9e): similar to male; inner margin of inner plate setose, lacking long plumose setae.

Gnathopod 1 (Fig. 9g): basis slender; merus with posterodistal process; carpus with a row of long setose on broad lobe, lacking serration (Fig. 9h); propodus subrectangular, palm oblique, simple, defined by pair of spines heavily striated distally, distal half of posterior margin setose; dactylus fitting palm. Gnathopod 2 (Fig. 9i): similar to gnathopod 1 but larger.

Coxa 1 (Fig. 9f): extended forward.

Gill of gnathopod 2 (Fig. 9j): shorter than basis of gnathopod 2.

Brood plate of gnathopod 2 (Fig. 9j): subtriangulate, margin with 102 short hooked setae (Fig. 9k).

Egg number 14.

Remarks

Hyale nuda is very close to *H. ayeli* Barnard, 1955, but the new species is distinguished from the latter illustrated by J. L. Barnard (1970) in the following features: in the eyes, the size is medium to small (vs. large); in the antenna 2, peduncular articles and flagellum have setal brushes dorsally (vs. ventrally), and the number of the flagellar articles is 23-articulated (vs. 15-articulated); in the pereopods 5 and 6, each basis has a notch on middle of posterior margin (vs. each basis is smooth on posterior margin); in the uropod 3, peduncle with 4 apicodorsal spines (vs. 2 apicodorsal spines).

Hyale nuda resembles *H. zuaque* Barnard, 1979, but the new species differs from the latter by the following features: in the antenna 2, peduncular articles and flagellum have setal brushes dorsally (vs. dorsally and ventrally), and the number of articles of flagellum is 23-articulated (vs. 14-articulated); in the maxilliped, article 4 of palp is slightly longer than the article 3 (vs. as long as the article 3); in the gnathopod 1, carpus has 4 anterior spines on distal end (vs. 1 anterior spine on distal hump); in the pereopods 5 and 6, carpus and propodus are short, stout (vs. slender).

Habitat

The new species inhabits among seaweeds in the intertidal zone.

Distribution

The new species has been found only Hachijo Island in the Izu Islands of southeastern Japan.

Etymology

The specific name refers to the lack of the marginal spines, excluding a locking spine, on the

propodi of the pereopods 3 and 4, and of the dorsal spines on the outer rami of the uropods 1 and 2.

Hyale triangulata sp. nov.

(Japanese name: Kadote mokuzu, new)

(Figs. 10-11)

Hyale schmidti: Iwasa, 1939, pp. 278-280, pl. 17, fig. 17. (not Heller, 1866)

Material examined

6 males and 4 ovigerous females on a green alga, *Ulva* sp., from the middle to lower regions in the intertidal zone at Sanagi Island in Kagawa Prefecture (34°20' N, 133°47' E), 17 April 1978, collected by Dr. T. Kasuya; 1 male (11.0 mm) on a green alga, *Ulva* sp., from the middle to lower regions in the intertidal zone at Hashirimizu in Kanagawa Prefecture (35°16' N, 139°44' E), 16 March 1977, collected by the author; 1 male (9.0 mm) on a green alga, *Ulva* sp., from the middle to lower regions in the intertidal zone at Shimonoseki in Yamaguchi Prefecture (33°58' N, 130°57' E), 3 March 1978, collected by the author; 1 male (8.0 mm) and 1 ovigerous female on a green alga, *Ulva* sp., from the middle to lower regions in the intertidal zone at Kannonzaki in Kanagawa Prefecture (35°15' N, 139°45' E), 31 January 1980, collected by the author.

Holotype: male (NSMT-Cr.15153), 10.1 mm, from Sanagi Island in Kagawa Prefecture, 17 April 1978. Allotype: ovigerous female (NSMT-Cr.15154, slide mount), 7.5 mm, same data as holotype.

Paratypes: 2 males and 1 ovigerous female (NSMT-Cr.15155), same data as holotype.

Diagnosis

Eyes: medium to small, circular. Maxilla 1: palp 1-articulate, elongate and longer than apical spine teeth on outer plate. Maxilliped: palp article 4 slender, with long apical spine and several inner marginal setae twice as long as apical spine. Gnathopod 1: propodus triangulate in form, palm extended to posterior margin in a straight line and the boundary between palm and posterior margin not clear, proximal posterior corner of propodus subquadrate; dactylus strongly curved. Gnathopod 2: basis broadly lobate anterodistally; ischium broad, with hemicircular lobe; propodus subovate in form, anteroproximal margin with 2-4 spines. Uropod 1: distolateral spine of peduncle elongate. Uropod 3: ramus short, about 1/2 of peduncle in length.

Description

Male (holotype): Eyes (Fig. 10a): medium to small, circular.

Antenna 1: tip of flagellum reaching 1/4 along flagellum of antenna 2; peduncular article 3 not reaching end of peduncular article 4 of antenna 2; each article of flagellum with 2 aesthetascs (Fig. 10b); flagellum 12-articulated. Antenna 2: about 40% of body length; peduncular article 5 subequal to articles 3 and 4 combined in length; each article of flagellum with 3 groups of short setae and a group of long setae subdistally (Fig. 10c); flagellum 28-articulated, 2.2 times as long as peduncle.

Upper lip (Fig. 10d): anterior margin rounded with short bristles. Left mandible (Fig. 11a): lacinia 5-dentate with 3 accessory blades; molar with a long plumose seta. Right mandible (Fig. 11b): lacinia tricuspat with 2 accessory blades; molar with a long plumose seta. Lower lip (Fig. 10e): ordinary, inner lobes indistinct. Maxilla 1 (Fig. 11c): palp 1-articulate, elongate and longer than apical spine teeth on outer plate. Maxilla 2 (Fig. 11d): inner plate with large pectinate seta at middle of medial margin; apical setae of outer plate longer than that of inner. Maxilliped (Fig. 11e): article 4 of palp slender, with long apical spine, several inner marginal setae twice as long as apical spine.

Gnathopod 1 (Fig. 11f): basis trapezoidal in form, anterior margin slightly convex with a stiff seta proximally, posterior margin with 2-3 setae; carpus lobe narrow and shallow, not extending beyond posterodistal corner of merus, posterior margin with 6-9 setae, lacking serration; propodus triangulate in form, palm extended to posterior margin in a straight line with fine ridges and the boundary between

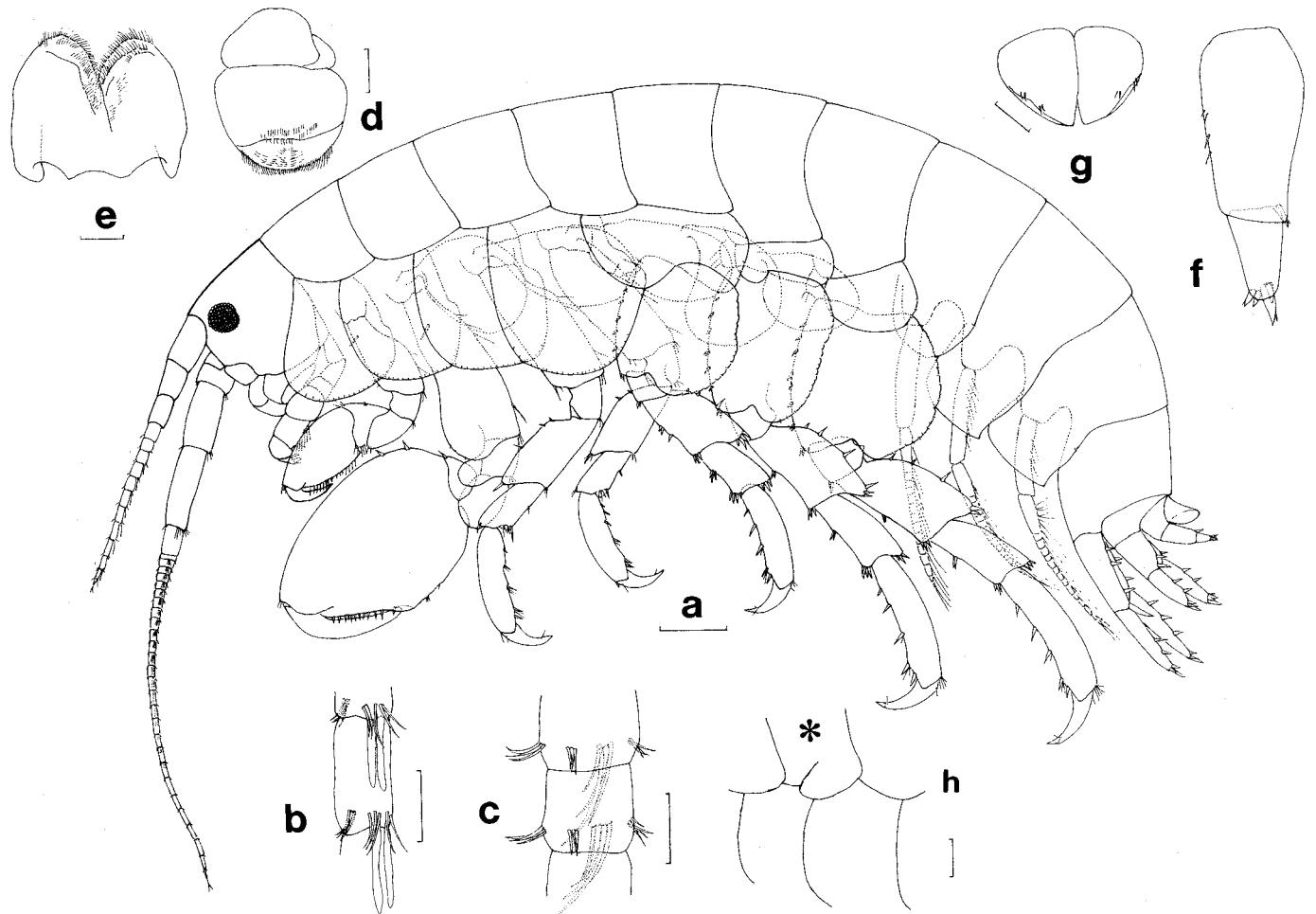


Fig. 10 *Hyale triangulata* sp. nov. a-g, holotype (male, 10.1 mm). a, lateral view; b, part of flagellum of antenna 1; c, part of flagellum of antenna 2; d, upper lip; e, lower lip; f, uropod 3; g, telson. h, allotype (female, 7.5 mm). h, preamplexing notch of peraeon segment 2 (*). Scale bars: a = 0.5 mm; b-g = 0.1 mm; h = 0.2 mm.

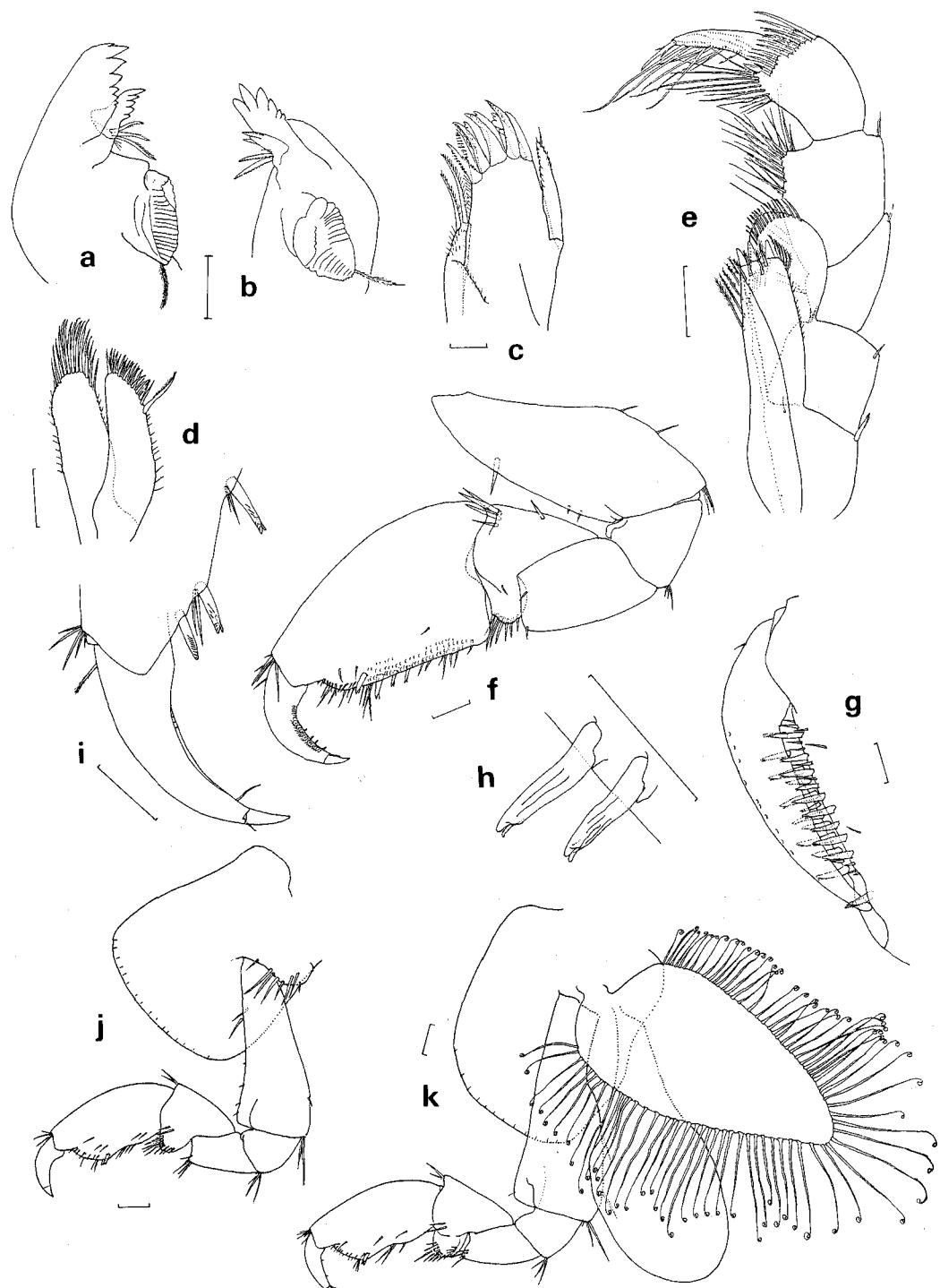


Fig. 11 *Hyale triangulata* sp. nov. a-i, holotype (male, 10.1 mm). a, left mandible; b, right mandible; c, maxilla 1; d, maxilla 2; e, maxilliped; f, gnathopod 1; g, palm dactylus of gnathopod 2; h, stout bifid spines on palm of gnathopod 2; i, dactylus and part of propodus of pereopod 7. j, k, allotype (female, 7.5 mm). j, coxa 1 and gnathopod 1; k, coxa 2, brood plate and gill of gnathopod 2. Scale bars: a-k = 0.1 mm.

palm and posterior margin not clear, proximal posterior corner of propodus subquadrate; dactylus strongly curved, inner margin with row of striation. Gnathopod 2: basis broadly lobate anterodistally; ischium with broad hemicircular lobe; propodus subovate in form, anteroproximal margin with 2-4 spines, palm slightly shorter than posterior margin, lined with stout bifid spines (Fig. 11g, h), proximal margin of palm with weak hump; dactylus fitting palm. Pereopods: pereopods 3-7 (Fig. 10a), each propodus with pair of locking spines, locking spines subequal size each other, distal locking spine weakly striated (Fig. 11i); propodi of pereopods 3-7 with 3-4 marginal spines; dactyli elongate with a small setule distally, simple or weakly striated on inner margins (Fig. 11i).

Coxae: coxae 1-4 (Fig. 10a) deep; coxa 1 broad, slightly extended forward; coxae 2 and 3, subquadrate; coxa 4 widest, with bisinuate posteroproximal excavation; coxal gills subovate.

Pleopods 1-3: each peduncle bearing 2 coupling spines, inner margin of basal articles on inner rami with clothes-pin spines.

Epimeron 1 (Fig. 10a): lower margin rounded, posterior margin with 1 small seta. Epimera 2 and 3: posterodistal corner subacute, posterior margins with seta.

Uropod 1 (Fig. 10a): peduncle subequal to rami in length, with marginal spines and elongate distolateral spine about 35 % of outer ramus in length; inner and outer rami with 3 and 2 dorsal spines, respectively. Uropod 2: inner ramus longer than outer ramus; inner and outer rami with 2 dorsal spines, respectively. Uropod 3 (Fig. 10f): peduncle with several setae on inner margin and 1-2 apicodorsal spines; ramus short, about 1/2 of peduncle, with 4-5 apical spines.

Telson (Fig. 10g): cleft completely, lobes subtriangular, lateral margin of each lobe with 2 groups of small setae.

Female (allotype): Peraeon segment 2 (Fig. 10h): preamplexing notch medium; anterior lobe smaller than posterior margin; posterior lobe shallow.

Gnathopod 1 (Fig. 11j): basis slightly tumid anterodistally; propodus slender, subrectangular, palm oblique, simple, defined by 2 spines, near middle of posterior margin concave; dactylus fitting palm. Gnathopod 2 (Fig. 11k): similar to gnathopod 1 but larger.

Gill of gnathopod 2 (Fig. 11k) longer than basis of gnathopod 2.

Brood plate of gnathopod 2 (Fig. 11k) subtriangular, widest proximally, margin with 75 long hooked setae.

Number of hatched juveniles 12.

Remarks

This species is identical with *Hyale schmidti* (Heller, 1866) in the sense of Iwasa (1939). *Hyale schmidti* was originally described from the Mediterranean Sea and recently redescribed by Krapp-Schickel (1974). *Hyale triangulata* is distinguished from *H. schmidti* sensu Krapp-Schickel (1974), in the following features: in the maxilliped, inner marginal setae on article 4 of palp are twice as long as apical spine (vs. inner marginal setae are shorter than apical spine); in the uropod 3, ramus is about 50% of peduncle in length and with 4-5 apical small spines (vs. ramus is about 64% of peduncle and with 7 apical elongate spines).

Hyale triangulata is close to *H. yaqui* Barnard, 1979, but the new species is distinguished from the latter by the following features: in the maxilliped, inner marginal setae on article 4 of palp are twice as long as apical spine (vs. inner marginal setae are shorter than apical spine); in the gnathopod 1, carpus lobe is narrow and shallow, not extending beyond posterodistal corner of merus (vs. lobe is broad and deep, extending beyond posterodistal corner of merus), palm extends to posterior margin in a straight line and the boundary between palm and posterior margin is not clear (vs. palm is distinctly defined by 2 spines).

Hendrycks and Bousfield (2001) newly utilized preamplexing notch of peraeon segment 2 of mature females of *Allorchestes* and other genera of family Hyalellidae as specific character states of reproductive morphology. The shape of preamplexing notch of this species is included *Protohyale* as

newly genus category by Hendrycks and Bousfield (pers. comm.).

Habitat

The new species inhabits under stones or among seaweeds from the middle to lower tidal zone.

Distribution

This new species occurs from Cheju-Do in South Korea to Hokkaido in Japan.

Etymology

The specific name refers to the triangular shape of the propodus of male gnathopod 1.

Hyale misakiensis sp. nov.

(Japanese name: Misaki mokuzu, new)

(Figs. 12-13)

Material examined

1 male and 1 immature female on a green alga, *Ulva* sp., from the middle to lower regions in the intertidal zone at Kannonzaki in Kanagawa Prefecture (35°15' N, 139°45' E), 18 January 1980, collected by the author.

Holotype: male (NSMT-Cr.15156, slide mount), 12.3 mm, from Kannonzaki in Kanagawa Prefecture, 18 January 1980. Allotype: immature female (NSMT-Cr.15157, slide mount), 7.1 mm, same data as holotype.

Diagnosis

Eyes medium, elliptic form. Maxilla 1: palp 1-articulate, elongate and longer than apical spine teeth on outer plate. Maxilliped: inner marginal setae on article 4 of palp subequal to apical spine in length. Gnathopod 1: propodus rectangular in form, palm defined by 2 spines. Gnathopod 2: basis broadly lobate anterodistally; ischium with broad hemicircular lobe; propodus subovate in form, anteroproximal margin with 2 spines. Uropod 1: distolateral spine of peduncle elongate. Uropod 3: ramus short, about 1/2 of peduncle in length.

Description

Male (holotype): Eyes (Fig. 12a): medium, elliptic form.

Antenna 1: tip of flagellum reaching 1/4 along flagellum of antenna 2; peduncular article 2 subequal to article 3 in length; each article of flagellum with 2 aesthetascs (Fig. 12b); flagellum 15-articulated. Antenna 2: about 48% of body length; peduncular articles 3-5 with a group of short setae on inner face; peduncular article 5 subequal to articles 3 and 4 combined in length; each article of flagellum with 2 groups of short setae and a group of long setae distally (Fig. 12c); flagellum 36-articulated, 3 times as long as peduncle.

Upper lip (Fig. 12d): anterior margin rounded with short bristles. Left mandible (Fig. 13a): lacinia 5-dentate with 3 accessory blades; molar with a long plumose seta. Right mandible (Fig. 13b): lacinia tricuspathe with 2 accessory blades. Lower lip (Fig. 12e): ordinary, inner lobes indistinct. Maxilla 1 (Fig. 13c): palp 1-articulate, elongate and longer than apical spine teeth on outer plate. Maxilla 2 (Fig. 13d): inner plate with large pectinate seta at middle of medial margin; apical setae of outer plate longer than that of inner. Maxilliped (Fig. 13e): inner marginal setae on article 4 of palp subequal to apical spine in length.

Gnathopod 1: anterior margin of basis sinuate; carpus lobe narrow and shallow, posterior margin with 10 setae, lacking serration; propodus rectangular in form, palm oblique, defined by 2 spines (outer and inner), shorter than posterior margin, middle of posterior margin lined with 7 setae; dactylus curved, fitting palm (Fig. 13f). Gnathopod 2: basis broadly lobate anterodistally; ischium with broad hemicircular lobe; propodus subovate in form, anteroproximal margin with 2 spines, palm slightly

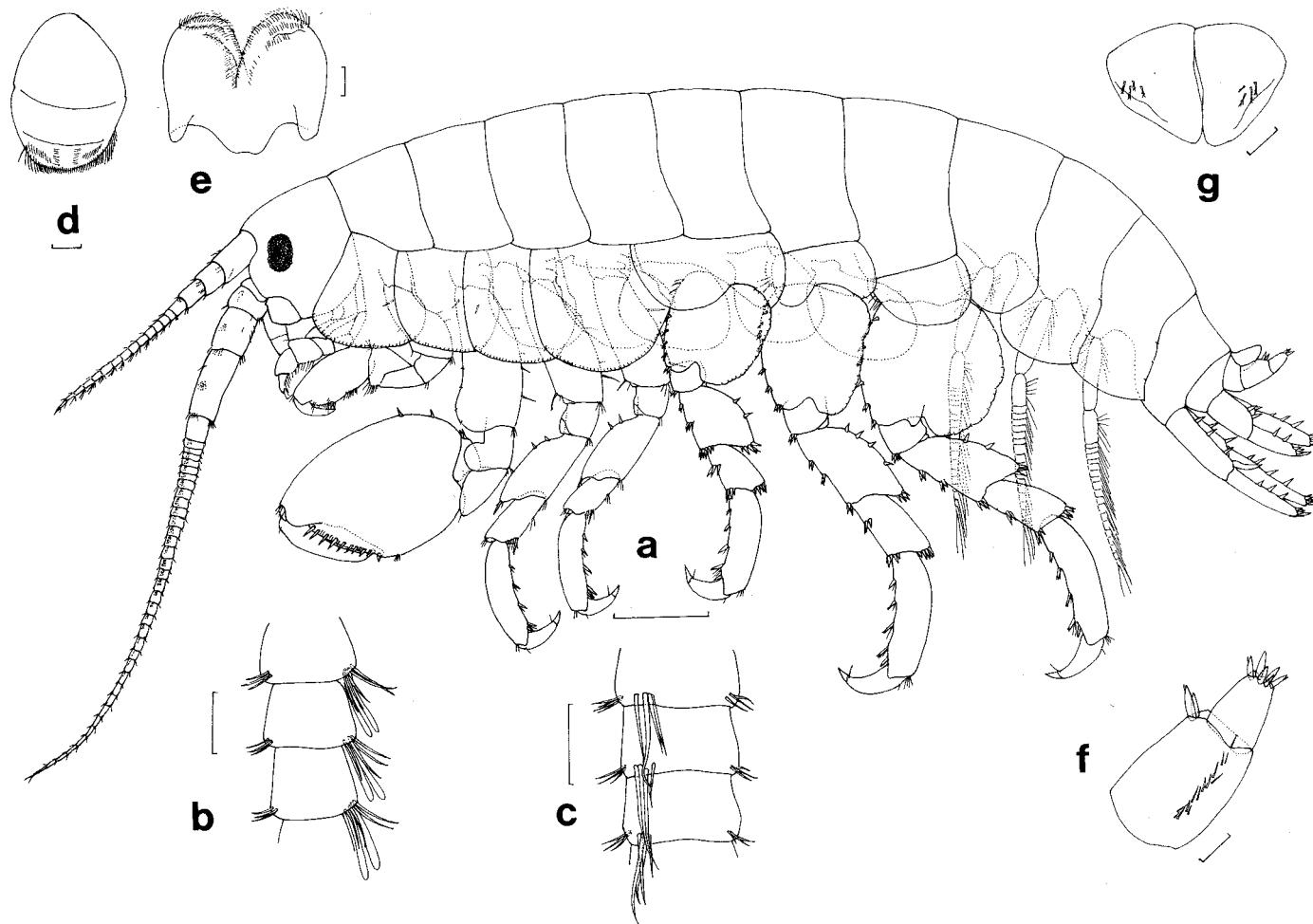


Fig. 12 *Hyale misakiensis* sp. nov., holotype (male, 12.3 mm). a, lateral view; b, part of flagellum of antenna 1; c, part of flagellum of antenna 2; d, upper lip; e, lower lip; f, uropod 3; g, telson. Scale bars: a = 1.0 mm; b-g = 0.1 mm.

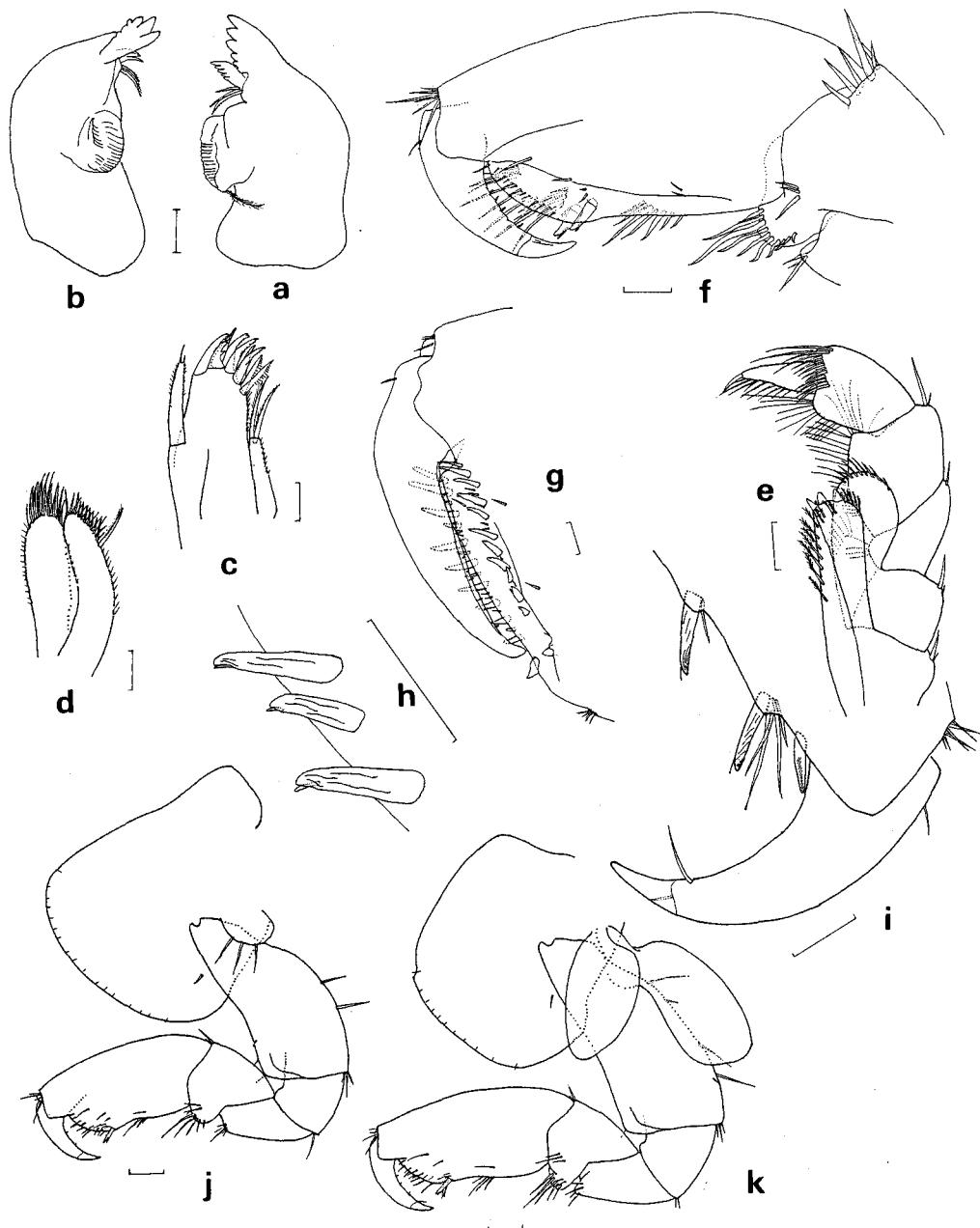


Fig. 13 *Hyale misakiensis* sp. nov. a-i, holotype (male, 12.3 mm). a, left mandible; b, right mandible; c, maxilla 1; d, maxilla 2; e, maxilliped; f, carpus, propodus and dactylus of gnathopod 1; g, palm and dactylus of gnathopod 2; h, stout bifid spines on palm of gnathopod 2; i, dactylus and part of propodus of pereopod 5. j, k, allotype (immature female, 7.1 mm). j, coxa 1 and gnathopod 1; k, coxa 2, brood plate and gill of gnathopod 2. Scale bars: a-k = 0.1 mm.

shorter than posterior margin, lined with stout bifid spines (Fig. 13g, h), proximal margin of palm with weak hump; dactylus fitting palm. Pereopods: pereopods 3-7 (Fig. 12a), each propodus with pair of locking spines, distal locking spine slightly smaller than proximal one, slightly bent, both spines weakly striated (Fig. 13i); propodi of pereopods 3-7 with 3 marginal spines; dactylus with a small setule distally, simple on inner margin.

Coxae: coxae 1-4 (Fig. 12a) deep; coxa 1 broad, slightly extended forward; coxae 2 and 3 subquadrate; coxa 4 widest, with bisinuate posteroproximal excavation; coxal gills subovate.

Pleopods 1-3: each pecuncle bearing 2 coupling spines, inner margin of basal articles on inner rami with clothes-pin spines.

Epimeron 1 (Fig. 12a): lower margin rounded. Epimera 2 and 3: posterodistal corner subacute.

Uropod 1 (Fig. 12a): peduncle subequal to rami in length, with marginal spines and elongate distolateral spine about 35 % of outer ramus in length; inner and outer rami with 4 and 3 dorsal spines, respectively. Uropod 2: inner ramus longer than outer ramus; inner and outer rami with 3 and 2 dorsal spines, respectively. Uropod 3 (Fig. 12f): peduncle with 14 setae on inner margin and 2 apicodorsal spines; ramus short, about 1/2 of peduncle, with 6 apical spines.

Telson (Fig. 12g): cleft completely, lobe subtriangular, lateral margin of each lobe with 4 plumose setae.

Female (allotype): Gnathopod 1 (Fig. 13j): basis relatively short, similar to male, middle of anterior margin slightly concave, tumid anterodistally; propodus slender, subrectangular, palm oblique, simple, defined by 2 spines, near middle of posterior margin concave; dactylus fitting palm. Gnathopod 2 (Fig. 13k): similar to gnathopod 1 but larger.

Gill of gnathopod 2 (Fig. 13k) shorter than basis of gnathopod 2.

Brood plate of gnathopod 2 undeveloped.

Remarks

Hyale misakiensis is close to *H. triangulata*, but the new species is distinguished from the latter by the following features: in the eyes, elliptic form (vs. circular); in the maxilliped, inner marginal setae on article 4 of palp are subequal to the apical spine in length (vs. twice as long as the apical spine); in the gnathopod 1, palm of propod is defined by 2 spines and the boundary between palm and posterior margin is distinct (vs. palm extends to posterior margin in a straight line and the boundary is indistinct).

Hyale misakiensis resembles *H. yaqui* Barnard, 1979, but the new species is distinguished from the latter in the following features: in the eyes, elliptic in form (vs. circular); in the maxilliped, article 4 of palp is shorter than article 3 (vs. article 4 is longer than article 3); in the gnathopod 1, carpus lobe is narrow and shallow, not extending beyond posterodistal corner of merus (vs. lobe is broad and deep, extending beyond posterodistal corner of merus).

Habitat

The new species occurred on a green alga, *Ulva* sp., from the middle to lower regions in the intertidal zone.

Distribution

The new species has been found from Kannonzaki at Kanagawa Prefecture in Japan.

Hyale latimana sp. nov.

(Japanese name: Kobute mokuzu, new)

(Figs. 14-15)

Material examined

3 males from seaweeds in the intertidal zone at Matsugaura in Kagoshima Prefecture (32°10' N, 130°10' E), 28 May 1979, collected by Dr. A. Hirayama.

Holotype: male (NSMT-Cr.15158, slide mount), 8.0 mm, from Matsugaura in Kagoshima Prefecture, 28 May 1979.

Diagnosis

Eyes: medium to large, subcircular. Antenna 2: long, about 50% of body length; flagellum 33-articulated. Maxilla 1: palp 1-articulate, elongate. Gnathopod 1: propodus expanded distally, anterodistal margin with hump and bearing 2 spine-like setae at distal end of anterior margin, palm defined by large and blunt cusp, palm convex and bearing a large spine (outer) at the defining corner. Gnathopod 2: palm with 2 rows of thin and long spines bearing fine setae distally, palm slightly longer than posterior margin. Pereopods 3-7: slender, each propodus with pair of locking spines, proximal locking spine largest in marginal spines. Uropod 1: distolateral spine of peduncle elongate.

Description

Male (holotype): Eyes (Fig. 14a): medium to large, subcircular.

Antenna 1: peduncular article 3 reaching distal end of peduncular article 4 of antenna 2; each article of flagellum with 2 aesthetascs (Fig. 14b); flagellum 17-articulated. Antenna 2: about 50% of body length; peduncular article 5 subequal to articles 3 and 4 combined in length; each article of flagellum with 2 groups of short setae distally (Fig. 14c); flagellum 33-articulated, 3 times as long as peduncle.

Upper lip (Fig. 14d): anterior margin rounded with short bristles. Left mandible (Fig. 15a): lacinia 7 1/2-dentate with 3 accessory blades; molar with a long plumose seta. Right mandible (Fig. 15b): lacinia tricuspathe with 2 accessory blades; molar with a long plumose seta. Lower lip (Fig. 14e): ordinary, inner lobes indistinct. Maxilla 1 (Fig. 15c): palp 1-articulate, elongate and longer than apical spine teeth on outer plate. Maxilla 2 (Fig. 15d): inner plate with large pectinate seta at middle of medial margin; apical setae of outer plate longer than that of inner. Maxilliped (Fig. 15e): article 4 of palp with apical spine and short marginal setae.

Gnathopod 1 (Fig. 15f): basis trapezoidal in form; ischium anterior margin with tumidity (outer); carpus lobe shallow, bearing 14 setae, lacking serration; propodus expanded distally, anterodistal margin with hump and bearing 2 spine-like setae at distal end of anterior margin, palm defined by large and blunt cusp, palm convex and bearing a large spine (outer) at the defining corner; dactylus curved, overlapping palm. Gnathopod 2 (Fig. 14a): basis broadly lobate anterodistally and lined with small setae; ischium with hemicircular lobe; propodus palm oblique, 2 rows of thin and long spines bearing fine setae distally, slightly longer than posterior margin, defined by 2 spines. Pereopods: pereopods 3-7 (Fig. 14a) slender, each propodus with 3 marginal spines and pair of locking spines, proximal locking spine largest in marginal spines, 3 marginal spines and 2 locking spines with heavily striated; dactylus bearing distal setule and weak castellation (Fig. 15g, h).

Coxae: coxa 1 (Fig. 14a) slightly extended forward; coxae 2 and 3 subquadratae; coxa 4 widest with bisinuate posteroproximal excavation; coxa 5 anterolobate, relatively deep.

Pleopods 1-3: each peduncle bearing 2 coupling spines, inner margin of basal articles on inner rami lined with 6, 6, and 7 clothes-pin spines, respectively.

Epimeron 1 (Fig. 14a): lower margin rounded. Epimera 2 and 3: posterodistal corner subacute.

Uropod 1 (Fig. 14a): peduncle subequal to rami in length, with marginal spines and elongate distolateral spine about 50 % of outer ramus in length; inner and outer ramus with 4 and 3 dorsal

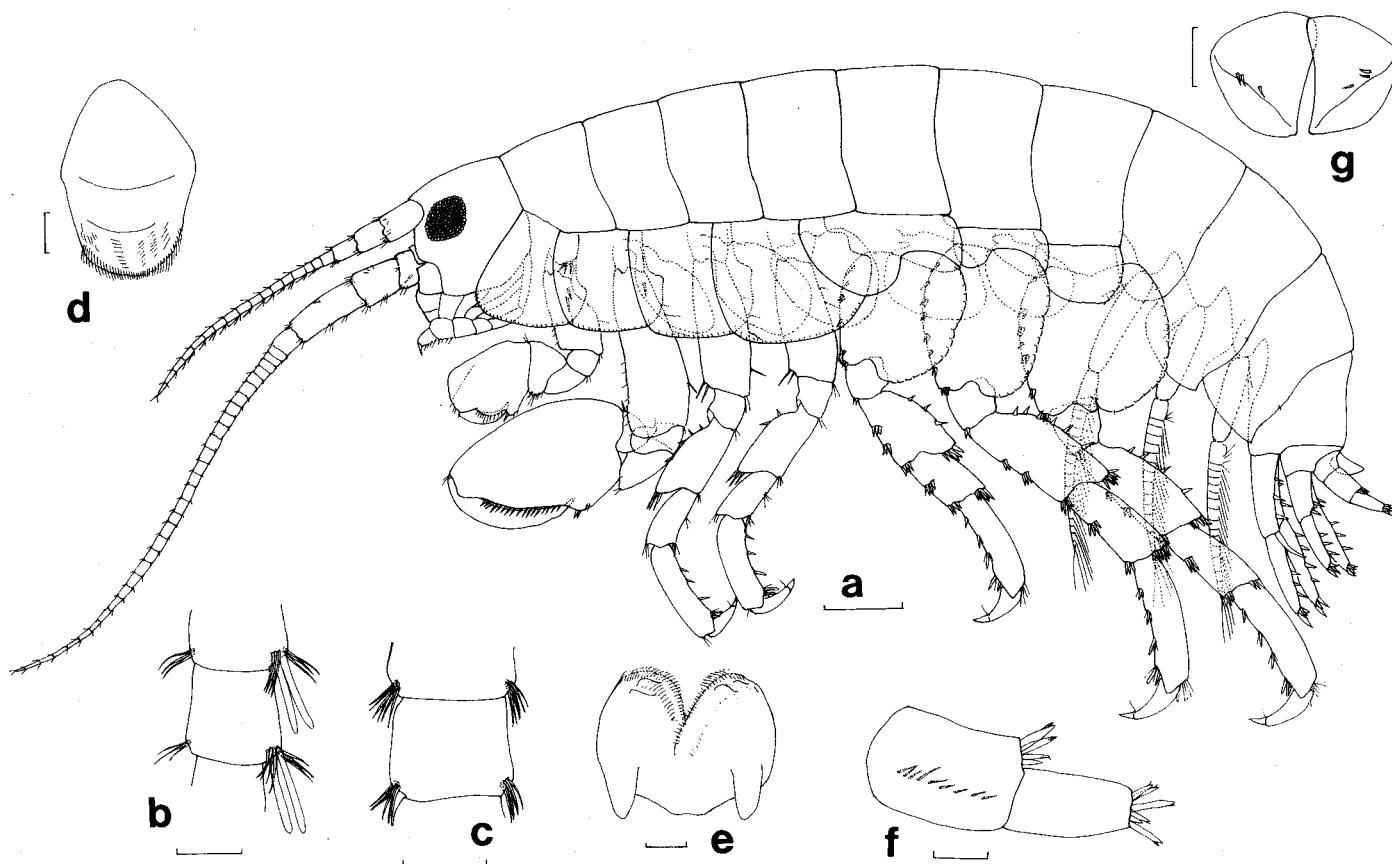


Fig. 14 *Hyale latimana* sp. nov., holotype (male, 8.0 mm). a, lateral view; b, part of flagellum of antenna 1; c, part of flagellum of antenna 2; d, upper lip; e, lower lip; f, uropod 3; g, telson. Scale bars: a = 0.5 mm; b-g = 0.1 mm.

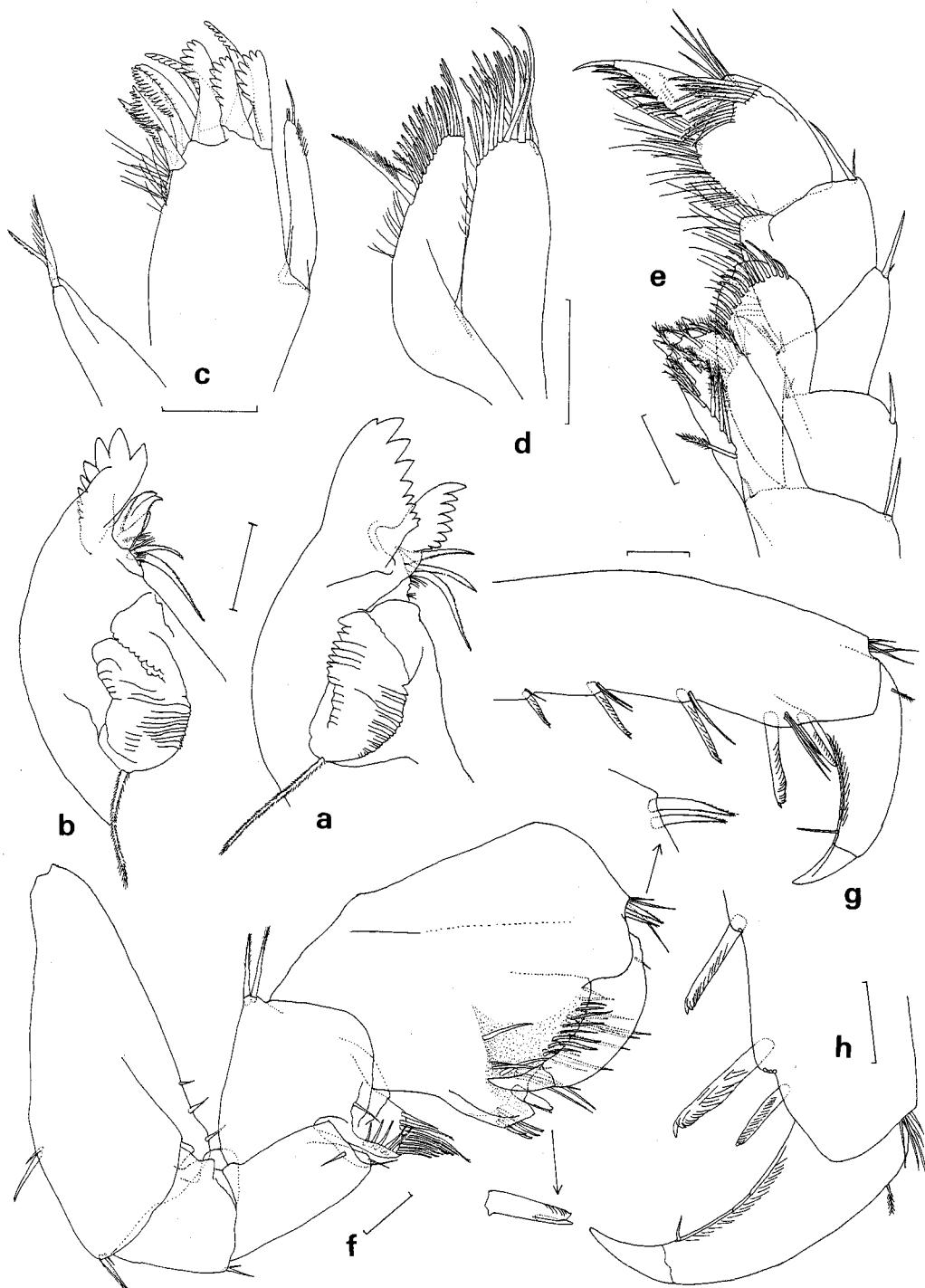


Fig. 15 *Hyale latimana* sp. nov., holotype (male, 8.0 mm). a, left mandible; b, right mandible; c, maxilla 1; d, maxilla 2; e, maxilliped; f, gnathopod 1; g, h, dactyls and a part of propods of pereopods 4 and 7, respectively. Scale bars: a-h = 0.1 mm.

spines, respectively. Uropod 2: inner ramus longer than outer ramus; inner and outer rami with 3 dorsal spines, respectively. Uropod 3 (Fig. 14f): peduncle subequal to ramus in length, with 9 small setae on inner margin and 4 apicodorsal spines; ramus with 6 apical spines.

Telson (Fig. 14g): cleft completely, lateral margin of each lobe with 3 small setae.

Remarks

Hyale latimana resembles *H. affinis* Chevreux, 1908, but the new species is distinguished from the latter illustrated by Barnard (1970) in the following features: in the gnathopod 1, anterodistal margin of the propodus is humped, and the palm is defined by large and blunt cusp, and has a large spine at the defining corner (vs. anterodistal margin is not humped, and the palm is defined by a pair of spines); in the gnathopod 2, the palm of the propod is slightly longer than the posterior margin (vs. the palm has more than twice as long as the posterior margin).

Habitat

The new species occurred from seaweeds in the intertidal zone.

Distribution

The new species has been found from Matsugaura at Kagoshima Prefecture in Japan.

Etymology

The specific name refers to the expanded propodus of gnathopod 1.

Hyale affinis Chevreux, 1908

(Japanese name: Fusatoge mokuzu, new)

(Figs. 16-17)

Hyale affinis Chevreux, 1908, pp. 503-506, figs. 21-22; Schellenberg, 1938, pp. 67-68;

J. L. Barnard, 1955, p.14; 1970, p. 251, 254, fig. 167 e-h.

Material examined

3 males from the intertidal zone at Matsugaura in Kagoshima Prefecture (32°10' N, 130°10' E), 28 May 1979, collected by Dr. A. Hirayama.

Diagnosis

Males (5.0-7.0 mm). Eyes (Fig. 16a): medium to large, subcircular. Antenna 1: peduncular article 3 reaching near middle of peduncular article 4 of antenna 2. Antenna 2: long, 54 % of body length; flagellum 29-articulated, about 3 times as long as peduncle. Gnathopod 1 (Fig. 17e): palm of propodus defined by pair of spines. Gnathopod 2: palm of propodus with 2 rows of thin and long spines bearing fine setae distally (Fig. 17g), defined pair of spines, palm slightly shorter than posterior margin; dactylus fitting palm. Pereopods 3-7 (Fig. 16a): slender, each propodus with pair of locking spines, proximal locking spine largest in marginal spines (Fig. 17h, i). Pleopods: inner margin of basal articles on inner rami with clothes-pin spines. Uropod 1 (Fig. 16a): distolateral spine of peduncle elongate.

Remarks

Three males examined in this study slightly differ from the *Hyale affinis* illustrated by Barnard (1970), collected in Hawaii, in the following features: in the gnathopod 1, distal anterior margin of propod is inclined (vs. ordinary shaped); in the gnathopod 2, the palm of propod is slightly shorter than the posterior margin (vs. the palm is longer than the posterior margin). Therefore, these specimens in Japan might be assigned as subspecies of *Hyale affinis*.

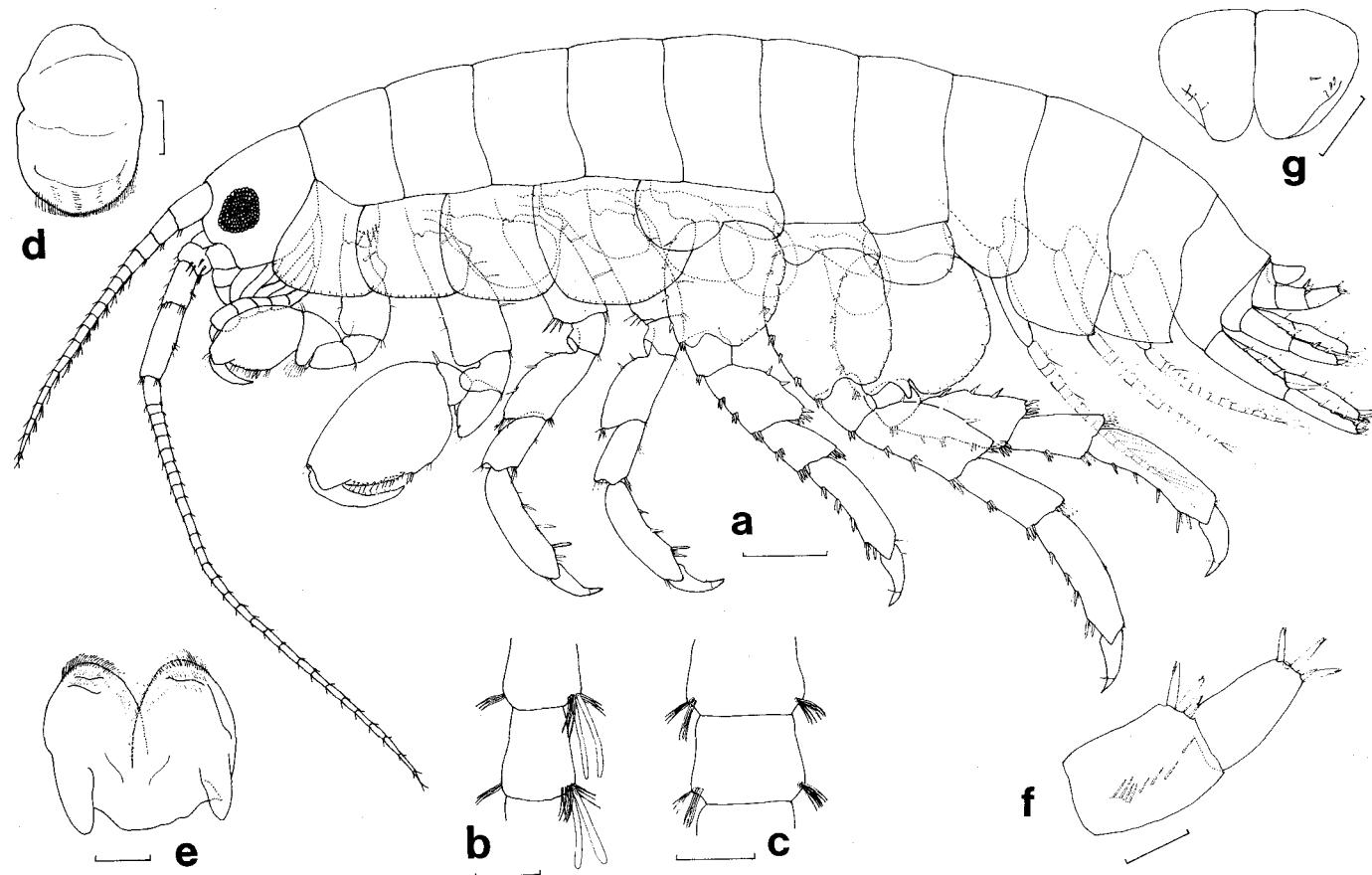


Fig. 16 *Hyale affinis* Chevreux. Male, 7.0 mm. a, lateral view; b, part of flagellum of antenna 1; c, part of flagellum of antenna 2; d, upper lip; e, lower lip; f, uropod 3; g, telson. Scale bars: a = 0.5 mm; b-g = 0.1 mm.

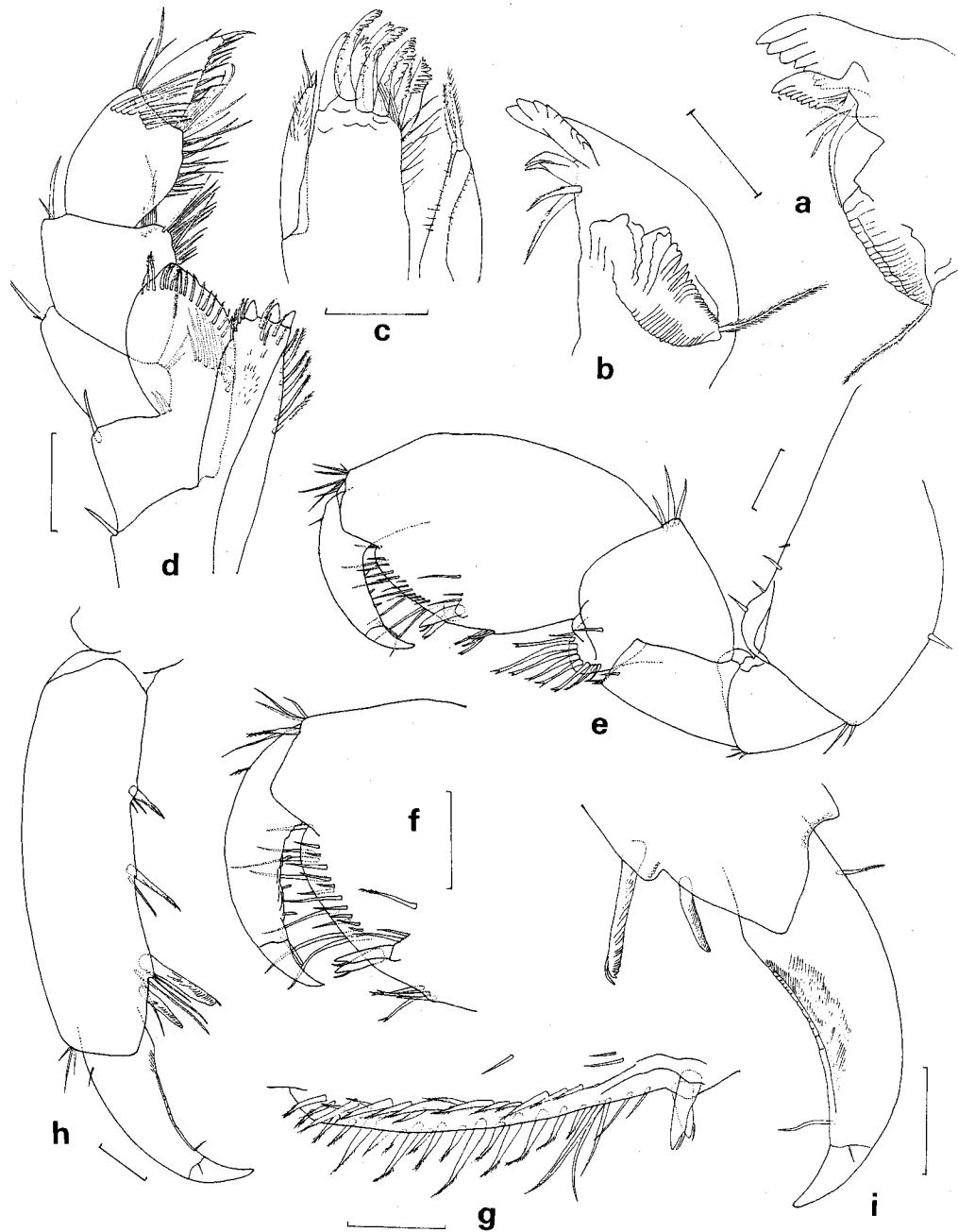


Fig. 17 *Hyale affinis* Chevreux. Male, 7.0 mm. a, left mandible; b, right mandible; c, maxilla 1; d, maxilliped, e, gnathopod 1; f, palm and dactylus of gnathopod 1; g, palm of gnathopod 2; h, i, dactyli and part of propodi of pereopods 4 and 7, respectively. Scale bars: a-i = 0.1 mm.

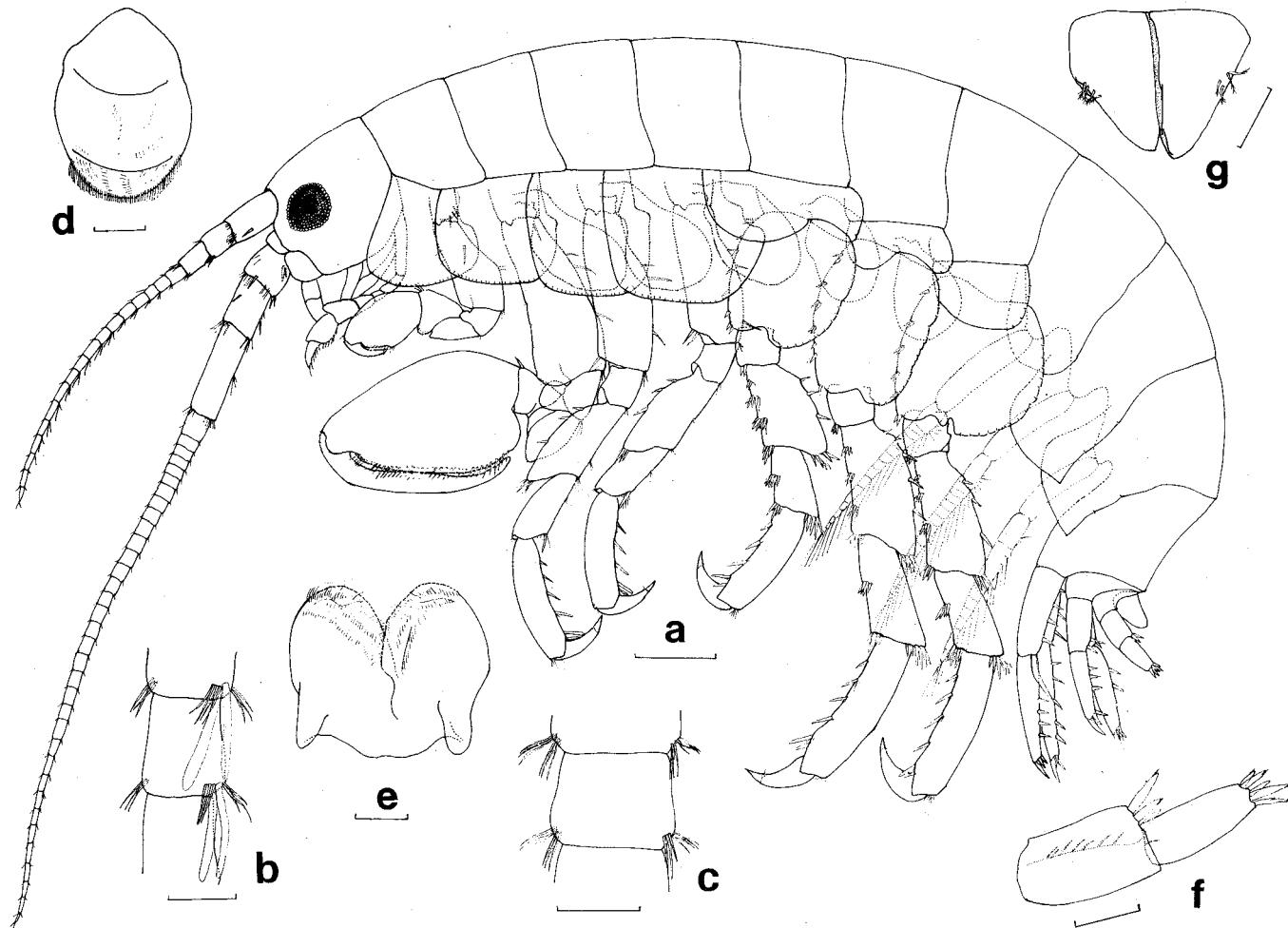


Fig. 18 *Hyale honoluluensis* Schellenberg. Male, 8.9 mm. a, lateral view; b, part of flagellum of antenna 1; c, part of flagellum of antenna 2; d, upper lip; e, lower lip; f, uropod 3; g, telson. Scale bars: a = 0.5 mm; b-g = 0.1 mm.

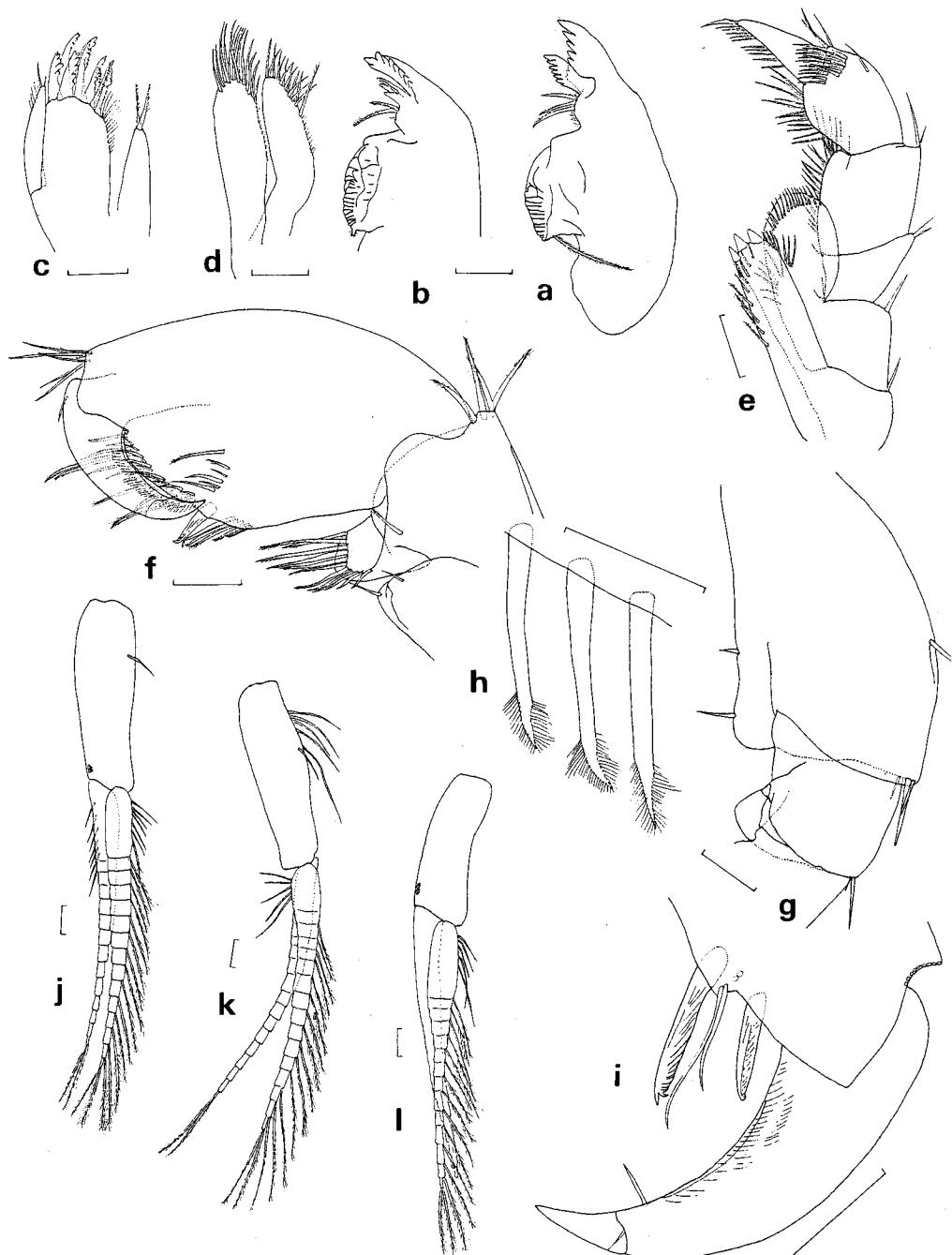


Fig. 19 *Hyale honoluluensis* Schellenberg. Male, 8.9 mm. a, left mandible; b, right mandible; c, maxilla 1; d, maxilla 2; e, maxilliped; f, carpus, propodus, and dactylus of gnathopod 1; g, basis and ischium of gnathopod 1; h, long spines bearing fine setae distally on palm of gnathopod 2; i, dactylus and part of propodus of pereopod 4; j-l, pleopods 1-3, respectively. Scale bars: a-g, i-l = 0.1 mm; h = 0.05 mm.

Habitat

The species inhabits among seaweeds in the intertidal zone.

Distribution

Hawaii, Poipu Beach, Kauai, Tropical Pacific, and Kagoshima in Japan.

***Hyale honoluluensis* Schellenberg, 1938**

(Japanese name: Honoruru mokuzu, new)

(Figs. 18-19)

Hyale honoluluensis Schellenberg, 1938, pp. 69-71, figs. 35b,c; J. L. Barnard, 1955, p. 18; 1965, p. 520, figs. 22, 23; 1970, p. 258, 259, figs. 167 a-d, 171.

Material examined

2 males and 2 females from the intertidal zone at Matsugaura in Kagoshima Prefecture (32°10' N, 130°10' E), 28 May 1979, collected by Dr. A. Hirayama. A male and a female from the intertidal zone at Sokodo in Hachijo Island (33°10' N, 139°50' E), 19 April 1984, collected by Dr. S. Suda.

Diagnosis

Male (7.0-8.9 mm). Eyes (Fig. 18a): medium to large, subcircular. Antenna 2: long, 54% of body length; flagellum 34-articulated, about 3 times as long as peduncle. Gnathopod 1: palm of propodus oblique, defined by 1 spine (outer); dactylus curved, overlapping palm (Fig. 19f). Gnathopod 2: palm of propodus occupying entire posterior margin, with 2 rows of long spines bearing fine setae distally (Fig. 19h). Pereopods 3-7 (Fig. 18a): slender, each propodus with pair of locking spines, proximal lacking spine largest in marginal spines. Pleopods: inner margin of basal articles on inner rami with clothes-pin spines. Uropod 1 (Fig. 18a): peduncle distinctly shorter than rami, with elongate distolateral spine about 50% of outer ramus. Uropod 2 (Fig. 18a): inner and outer rami distinctly longer than peduncle, and outer ramus shorter than inner ramus. Uropod 3 (Fig. 18f): peduncle subequal to ramus in length.

Habitat

The species inhabits among seaweeds in the intertidal zone.

Distribution

Hawaiian, Phoenix, and Marshall Islands. Tropical Pacific. Southern parts of Japan.

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